DEFENSE INFORMATION SYSTEMS AGENCY

JOINT INTEROPERABILITY TEST COMMAND
FORT HUACHUCA, ARIZONA

MILITARY STANDARD-188-184 WAVEFORM CONFORMANCE TEST PROCEDURES

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MILITARY STANDARD-188-184
WAVEFORM CONFORMANCE
TEST PROCEDURES

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INTRODUCTION

Military Standard (MIL-STD)-188-184 defines an interoperable waveform standard for data controllers required to operate over single-access, 5- and 25-kilohertz (kHz) ultra high frequency (UHF) satellite communications (SATCOM) channels. These channels are known as dedicated channels, in accordance with MIL-STD-188-181. Data controllers use data compression, adaptive error-correction, and packet communications techniques to reliably control the flow of data over noisy communications channels at high throughput rates.

The Data Control (DC) waveform provides data compression, packet communications, and adaptive error-correction processing of user data to allow high-throughput reliable data transfer over noisy communications channels. The data controller is installed between the data terminal and the digital communications channel, such as an encryption device or radio. Prior to transmission, the transmitting data controller processes user data according to the DC waveform. A similar data controller at the receiving end of the communications channel processes the DC waveform to retrieve original user data and forward it to the end-user data terminal. Waveform processing allows data controllers to overcome the effects of noise on the communications channel, thereby providing highly reliable error-free message delivery.

MIL-STD conformance testing will determine the level of compliance to requirements established in MIL-STD-188-184. A requirements matrix is listed in table B-1 of appendix B. The test procedures are described in appendix C.

If test item performance does not meet a requirement, the failure and its potential operational impact will be discussed. Any required capabilities that are not implemented will also be discussed.

The Joint Interoperability Test Command will conduct standards and conformance testing at Fort Huachuca, Arizona.

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APPENDIX A

ACRONYMS

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APPENDIX A

ACRONYMS

ACK	Acknowledgement Burst
ARQ	Automatic Repeat Request
BER	Bit Error Ratio
BC	Broadcast
bps	bits per second
COMSEC	Communications Security
CRC	Cyclic Redundancy Check
dB	decibel or decibels
DC	Data Controller
DOD	Department of Defense
ea	each
EOM	End of Message
f	frequency
FEC	Forward Error Correction
FED-STD	Federal Standard
Hz	hertz
ID	Identifier
kHz	kilohertz
LSB	Least Significant Bit
MC	Multicast
Mesg	Message
MHz	megahertz
MIL-STD	Military Standard
MPB	Multicast Probe Burst
MSB	Most Significant Bit
msec	milliseconds
PA	Probe Acknowledgement
PB	Probe Burst
PRI	Priority
PTP	Point-to-Point
REQ	Request

APPENDIX A

ACRONYMS (continued)

REV	Revision
RSYNC	Resynchronization
SATCOM	Satellite Communications
SOM	Start-of-Message
txt	text file
UUT	Unit Under Test
UHF	Ultra High Frequency

APPENDIX B

MIL-STD-188-184 REQUIREMENTS MATRIX

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Table B-1.1. MIL-STD 188-184 Requirements Matrix

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
1	4.2(1)	Each data controller shall have a unique network identifier (ID), operator-selectable to a value from 1 to 64.	1
2	4.2(2)	Data controllers shall process and respond to all bursts that contain their network ID.	1, 17
3	4.2.1	A lossless data compression algorithm, interoperable with the algorithm defined in 5.1.2.1 and 5.2.2.6, shall be used to improve throughput.	12
4	4.2.2	Long messages shall be split into packets.	13
5	4.2.3	With ARQ enabled, receiving data controllers shall provide feedback to the transmitting data controller, using the ARQ protocol defined in 4.5.1 and 5.3.1.	23
6	4.2.4(1)	FEC shall be used, as defined in 5.1.2.3 and 5.2.2.4, to provide improved bit error ratio (BER) performance over noisy communications channels.	11
7	4.2.4(2)	FEC shall be adaptive.	10
8	4.3.1(1)	The SOM shall be 64 bits long…	2
9	4.3.1(2)	…and shall be transmitted without FEC encoding at the beginning of every burst.	2
10	4.3.2(1)	Header bit-field definitions shall be as defined in 5.4.	3
11	4.3.2(2)	Header structure shall be as defined in 5.1.2.5.	3
12	4.3.3(1)	User data shall be grouped into data packets for transmission.	13
13	4.3.3(2)	The number of user data bits in each packet and the chosen FEC rate shall vary in accordance with this military standard.	13
14	4.3.3(3)	All packets in a single burst shall have the same length and use the same FEC rate, as described in 5.3.3.	13
15	4.3.3(4)	The number of packets per data burst shall be from 1 to 256.	13
16	4.4.1	The communications modes described in 4.4.1.1 through 4.4.1.3 shall be supported.	14
17	4.4.1.1	Two types of PTP messages shall be supported: with acknowledgment and without acknowledgment.	1
18	4.4.1.2	Broadcast messages are destined to all members of the network and shall not be acknowledged.	22

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
19	4.4.1.3(1)	Multicast messages shall be addressed to as many as 10 net members.	24
20	4.4.1.3(2)	Two types of Multicast messages shall be supported: with acknowledgment and without acknowledgment.	1
21	4.4.2	The following burst types shall be used to support connectivity of the three communications modes: [listed in MIL-STD] (TEST AFTER RESYNCHRONIZATION PROCEDURE)	14
22	4.5(1)	The waveform protocols described in 4.5.1 through 4.5.7 and 5.3.1 through 5.3.7 shall be supported on both full- and half-duplex communications channels.	33
23	4.5(2)	Message transfer shall be restricted to one direction at a time.	33
24	4.5(3)	Transmitting data controllers shall be able to receive ACKs and RSYNCs sent prior to the end of the burst.	33
25	4.5.1	Acknowledgment shall be enabled or disabled on a message-by-message basis, using the No ARQ bit in the header.	1
26	4.5.1.1(1)	The PTP ACK protocol, illustrated in figure 7 [of the MIL-STD], shall be used to provide error-free delivery to a single destination.	23
27	4.5.1.1(2)	After transmission of each data burst, the receiving data controller shall reply with an ACK, indicating receipt of the data burst and which packets, if any, were received in error.	23
28	4.5.1.1.1(1)	If the transmitting data controller does not receive an ACK, it shall time-out, in accordance with 5.3.1.1,…	8
29	4.5.1.1.1(2)	…and shall retransmit the last transmitted burst without incrementing the burst ID.	8
30	4.5.1.1.1(3)	If after consecutive retransmissions, greater than the Maximum Number of Retries, acknowledgment is still not received, the transmitting data controller shall abort the message and should notify the operator.	8
31	4.5.1.1.2(1)	Packets incorrectly received shall be retransmitted first, in the order in which they were originally transmitted.	9
32	4.5.1.1.2(2)	The remainder of the burst shall be filled with new packets.	9

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
33	4.5.1.1.2(3)	If the format (code rate and packet size) of the burst is the same as the last burst, only those packets received in error shall be retransmitted.	9
34	4.5.1.1.2(4)	If the format of the burst is different from the last burst, all packets after, and inclusive of, the first packet received in error shall be retransmitted as new packets.	9
35	4.5.1.2	Acknowledgment slots shall follow the end of the data burst in ascending order, by destination address.	23
36	4.5.1.2.1(1)	If the transmitting data controller does not receive an ACK from all destinations, it shall time-out, in accordance with 5.3.1.2,…	8
37	4.5.1.2.1(2)	…and shall retransmit the last burst without incrementing the burst ID.	8
38	4.5.1.2.2(1)	Following receipt of acknowledgment bursts, the transmitting data controller shall retransmit packets that were incorrectly received by any acknowledging destinations.	9
39	4.5.1.2.2(2)	If the current burst format (code rate and packet size) is the same as the last burst, the transmitting data controller shall retransmit the union of all packets received in error.	9
40	4.5.1.2.2(3)	If the current burst format is different from the last burst, all data starting with the data in the first packet received in error shall be retransmitted using the new burst format.	9
41	4.5.1.2.3(1)	The MC header extension shall include a bit-mapped Packet Repeats field that has 1 bit for every packet of the last acknowledged burst.	24
42	4.5.1.2.3(2)	The transmitting data controller shall set the bits of the Packet Repeats field to inform the destinations what packets of the last acknowledged burst are retransmitted.	9
43	4.5.1.2.3(3)	If the current burst format is different from the last acknowledged burst, all bits in the Packet Repeats field following the first packet in error shall be set.	9
44	4.5.1.2.3(4)	If the current burst format is the same as the last acknowledged burst, only those bits in the Packet Repeats field corresponding to the union of packets received in error shall be set.	9
45	4.5.1.2.3(5)	If the union of packets received in error includes all packets of the last acknowledged burst, then all bits in the field shall be set,…	9

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
48	4.5.2.1	To reduce the possibility of interfering with other data controllers sharing a channel, data controllers shall inhibit transmissions when channel activity is detected.	26
49	4.5.2.2(1)	Probing is selectable on a message-by-message basis and shall be enabled only for channels that provide a return communications path.	1
50	4.5.2.2(2)	When probing is enabled, a transmitting data controller shall send a probe to verify that the channel is available prior to sending a PTP or MC message.	1
51	4.5.2.2(3)	A PB, addressed to the intended message destination, shall be used for a PTP message.	1
52	4.5.2.2(4)	An MPB, addressed to the intended message destinations, shall be used for an MC message.	1
53	4.5.2.2(5)	Receiving data controllers shall respond to a PB or MPB with a PA.	20
54	4.5.2.2(6)	When a PA is not received, the transmitting data controller shall wait a random backoff period before retrying.	20
55	4.5.3(1)	Allowable code rate and packet sizes shall be as listed in 5.3.3.	13
56	4.5.3(2)	FEC code rate and packet size shall be indicated through the PTP, BC, and MC header Code Rate and Packet Size fields, as described in 5.4.1 and 5.4.3.	13
57	4.5.3(3)	When ARQ is enabled, the FEC code rate shall be determined on a burst-by-burst basis, as specified in 5.3.3.	11
58	4.5.6	Flow control shall be supported through the Number of Requested Packets field in the ACK header, as described in 5.4.2.	18
59	4.5.7(1)	When a receiving data controller detects a message or burst synchronization error, or one of several other errors described in 5.3.7, an RSYNC burst shall be transmitted to signal the error condition.	25
60	4.5.7(2)	The RSYNC burst shall be sent in lieu of an ACK burst.	25
61	5.1.1(1)	The data controller shall wait for an idle channel, as determined by the carrier sensing mechanism (see 5.3.2.1)…	26
62	5.1.1(2)	…and shall use the backoff algorithm defined in 5.3.2.2 to determine when to transmit.	26

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
63	5.1.1(3)	If channel probing (contention resolution) is enabled, the data controller shall transmit a probe burst (PB) or multicast probe burst (MPB) and then wait for a probe acknowledgment burst (PA) from the receiving data controller(s).	1
64	5.1.1(4)	If a PA is not received, the data controller shall again use the backoff algorithm to determine when to transmit another PB or MPB.	20
65	5.1.1(5)	If a PA is received, or channel probing is not enabled, the data controller shall format and send a data burst.	1
66	5.1.1(6)	If automatic repeat-request (ARQ) operation is not enabled, the data controller shall continue to format and send data bursts until the entire message is transferred.	1
67	5.1.1(7)	If ARQ operation is enabled, the data controller shall wait for an acknowledgment burst (ACK).	1
68	5.1.1(8)	If an ACK is not received within a predetermined amount of time, the data controller shall resend the original data burst with the same burst ID.	8
69	5.1.1(9)	The data controller shall continue to retransmit the original data burst until either an ACK is received or a maximum number of retries is exceeded.	8
70	5.1.1(10)	In the event that a maximum number of retries is exceeded, the message shall be aborted, as specified in 5.3.1.1 and 5.3.1.2.	8
71	5.1.1(11)	If the ACK is received, the data controller shall format and send the next burst.	8
72	5.1.1(12)	This process shall continue until the entire message is transferred.	8
73	5.1.2(1)	A message received from the data terminal shall be compressed, if compression is enabled, and should be buffered until there is enough data to fill an entire data burst, or the end of the message is reached.	16
74	5.1.1(2)	At this point, a header shall be formatted and encoded.	16
75	5.1.2(3)	The received data shall be packetized, and, when necessary, cyclic redundancy check (CRC)- and FEC-encoded in preparation for transmission.	16
76	5.1.2(4)	The burst transmission shall begin with the start-of-message (SOM), then the header, followed by data packets.	16
77	5.1.2(5)	This process shall continue until all data packets have been sent.	16

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
78	5.1.2.1(1)	The compression bit in the point-to-point (PTP), broadcast (BC), and multicast (MC) headers shall indicate to the receiving data controller whether or not the message data is compressed.	12
79	5.1.2.1(2)	Compression shall be enabled on a message-by-message basis by the transmitting data controller.	1
80	5.1.2.1(3)	When compression is enabled, a dictionary-based algorithm interoperable with the Lempel-Ziv algorithm [ZIV 77], with extensions described in [BELL 86], shall be used.	12
81	5.1.2.1(4)	For the Data Control (DC) waveform, the parameters in table I [of the MIL-STD] shall be used.	12
82	5.1.2.1(5)	For a character codeword, the type field shall be bit position 9, followed by the 8-bit character field.	12
83	5.1.2.1(6)	For a code-type codeword, the type field shall be bit position 16, followed by an 11-bit pointer field and a 4-bit match length field.	12
84	5.1.2.1(7)	The pointer field shall contain the left pointer described in [BELL 86].	12
85	5.1.2.1(8)	The match-length field shall contain the longest match, as described in [BELL 86].	12
86	5.1.2.1(9)	The match length shall be between 3 (the minimum match length) and 16 (the size of the look ahead buffer).	12
87	5.1.2.1(10)	The encoding of match-length values shall be as shown in table II [of the MIL-STD].	12
88	5.1.2.1(11)	The 4-bit match-length field has 2 extra binary codes: 1110 shall be used to signal the end-of-file,…	12
89	5.1.2.1(12)	…and 1111 shall be reserved for future use.	12
90	5.1.2.1(13)	Data generated by the compression algorithm shall be partitioned into 8-bit bytes, beginning with the most significant bit (MSB) of the first codeword and continuing in bit order.	12
91	5.1.2.1(14)	The end-of-file code shall be used to indicate the end of the compressed file,…	12
92	5.1.2.1(15)	…and unused data bits in the last byte shall be considered "don't care."	12
93	5.1.2.1(16)	The match length shall also be set to zero for an end-of-file codeword.	12

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
94	5.1.2.1(17)	The compressed data shall then be transmitted in bit order from left to right, starting with the least significant bit (LSB) of the first byte and continuing in byte order, as shown in figure 12 [of the MIL-STD] and described in 5.1.2.2.	12
95	5.1.2.1(18)	When compression is disabled, the compression algorithm shall be bypassed.	12
96	5.1.2.2(1)	Messages are transmitted as data bursts. Each burst shall contain a maximum of 256 data packets.	13
97	5.1.2.2(2)	Data bits to be transmitted shall be grouped into individually decodable data packets.	13
98	5.1.2.2(3)	Each packet shall have a data field that contains a fixed number of data bits,…	13
99	5.1.2.2(4)	…and, when necessary, the data field shall be followed by a CRC field for error detection and a flush field that contains encoder flush bits.	13
100	5.1.2.2(5)	All packets in a burst shall have the same number of data bits…	13
101	5.1.2.2(6)	…and shall be FEC-encoded at the same rate; however, packet sizes and FEC may vary from burst to burst.	13
102	5.1.2.2(7)	Data packet sizes shall be *P* = 512, 760, 864, or 1024 data bits.	13
103	5.1.2.2(8)	The transmitting data controller shall select the packet size and FEC code rate and indicate this to the receiving data controller by fields in the PTP, BC, or MC header.	13
104	5.1.2.2(9)	When ARQ is enabled, the transmitting data controller shall select the packet size and FEC code rate, base 27.72 427.72feedback27.72from the receiving data controller, as described in 4.5.3 and 5.3.3.	13
105	5.1.2.2.1(1)	Packets shall be encode 27.72and transmitted in bit order, left to right (see27.72figure 12 [of the MIL-STD]).	13
106	5.1.2.2.1(2)	The data27.72field shall come27.72first, with the27.72LSB27.72 f byte 127.72first and continuing in byte order.	
107	5.1.2.2.1(3)	The data27.72field shall be27.72filled let to right with data.	13
108	5.1.2.2.1(4)	The last packet of a27.72message shall be stuffed if the packet size does not evenly divide the2message length.	4
109	5.1.2.2.1(5)	Stuffing shall consist of inve	

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
110	5.1.2.2.1(6)	A bit in the PTP, BC, and MC header shall be set to notify the receiving data controller to unstuff the last packet.	4
111	5.1.2.2.1(7)	Byte stuffing is possible because message data received from the data terminal, and compressed data generated by the compression algorithm, shall be an integral number of bytes.	4
112	5.1.2.2.2(1)	The CRC shall be applied only to the data field.	6
113	5.1.2.2.2(2)	The CRC shall be formulated working left to right through *P* information bits, with an initial shift register value of zero.	6
114	5.1.2.2.2(3)	The CRC shall be sent in bit order from left to right, with the first bit in the CRC field being the LSB of the 24-bit CRC (see figure 12 [of the MIL-STD]).	6
115	5.1.2.2.2(4)	For stuffed packets, the CRC shall be applied only to the original data bits, not the stuff bytes.	6
116	5.1.2.2.2(5)	The generator polynomial for the CRC code shall be $g(x) = (x + 1)\ p(x)$ where $p(x) = (x^{23} + x^{17} + x^{13} + x^{12} + x^{11} + x^{9} + x^{8} + x^{7} + x^{5} + x^{3} + 1)$	6
117	5.1.2.2.2(6)	A CRC shall be appended to the data field only when ARQ is enabled.	6
118	5.1.2.2.3(1)	To flush the encoder, the data controller shall append 8 zero bits to the packet prior to FEC encoding, as discussed in 5.1.2.3.	11
119	5.1.2.2.3(2)	Flush bits shall not be appended to rate 1 encoded packets.	11
120	5.1.2.3(1)	Each received packet (information and flush bits, and CRC bits, if necessary) shall be FEC-encoded prior to transmission at one of the following code rates: 1/2, 3/4, 7/8, or 1.	11
121	5.1.2.3(2)	The code rate shall be determined by the transmitting data controller, based on feedback from the receiving data controller.	16
122	5.1.2.3(3)	The transmitting data controller shall indicate the FEC code rate to the receiving data controller via a field in the PTP, BC, or MC header, as described in 5.4.1 and 5.4.3.	11
123	5.1.2.3.1(1)	Convolutional codes shall be used for FEC.	11
124	5.1.2.3.1(2)	The basic code shall be a rate 1/2, constraint length 7 code (denoted $r = 1/2$, $k = 7$).	11
125	5.1.2.3.1(3)	The code tap positions shall be as shown in figure 13 [of the MIL-STD] and described below.	11

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
126	5.1.2.3.1(4)	The encoder shall be initialized to all zeros prior to encoding each header and each packet of data.	11
127	5.1.2.3.1(5)	The encoder outputs, C0 and C1, shall provide the first and second bits to be transmitted, respectively.	11
128	5.1.2.3.1(6)	The process of shifting data into the encoder and taking data from the encoder outputs C0 and C1 shall then continue until each of the flush bits marking the end of the block has been shifted into the encoder.	11
129	5.1.2.3.1(7)	The highest-rate code used for data packets shall be rate 1.	11
130	5.1.2.3.1(8)	For this rate, the information bits and CRC bits in the packet shall be transmitted without encoding.	11
131	5.1.2.3.1(9)	Code rates lower than 1/2 shall be obtained from the basic 1/2 code by repeating blocks of rate 1/2 encoded data.	11
132	5.1.2.3.2(1)	From the rate 1/2 code, higher rate 3/4 and 7/8 codes shall be constructed by a technique known as *puncturing*.	11
133	5.1.2.3.2(2)	The puncturing pattern used for these codes shall be as given in table III [of the MIL-STD].	11
134	5.1.2.3.2(3)	Only those bits identified with a 1 in table III [of the MIL-STD] shall be transmitted.	11
135	5.1.2.3.2(4)	They are transmitted in pairs, as described above, and shall be transmitted from left to right.	11
136	5.1.2.3.2(5)	The puncturing pattern shall be reset following the encoding of each separate block (header or packet) of information.	11
137	5.1.2.3.3	The resulting encoded packet size shall be as specified in table IV [of the MIL-STD].	11
138	5.1.2.4(1)	Each burst shall begin with a 64-bit SOM sequence.	2
139	5.1.2.4(2)	The SOM shall be transmitted without FEC encoding.	2
140	5.1.2.4(3)	The SOM sequence shall be as shown below: SOM = 0110000101001111010001110010010110111011001101010111111000001001	2
141	5.1.2.4(4)	The sequence shall be transmitted in bit order, left to right.	2
142	5.1.2.4(5)	The SOM shall be sent first, followed by the header, and then the data packets.	2

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
143	5.1.2.5(1)	In the DC waveform, headers shall be encoded at rate 1/8 to provide a high probability of error-free decoding on noisy channels.	3
144	5.1.2.5(2)	Headers that consist only of a header kernel shall be fixed length.	3
145	5.1.2.5(3)	They shall include a fixed-length header kernel and a variable-length header extension, as illustrated in figure 15 [of the MIL-STD].	3
146	5.1.2.5(4)	The header shall indicate the existence and length of the header extension.	3
147	5.1.2.5(5)	A CRC field and a flush field shall be included with the header.	3
148	5.1.2.5(6)	For fixed-length headers, the CRC shall be computed using only 48-kernel header information bits, as specified in figure 14 [of the MIL-STD].	6
149	5.1.2.5(7)	For headers with an extension, the 24-bit CRC and the 8 flush bits in the kernel shall be initialized to all zeros.	6
150	5.1.2.5(8)	The CRC shall be computed using all 80 bits of the header kernel and the variable-length header extension, excluding flush bits.	6
151	5.1.2.5(9)	The 24-bit CRC shall then be placed in the CRC field of the header kernel, as specified in figure 15 [of the MIL-STD].	3
152	5.1.2.5(10)	The header shall be transmitted LSB first,…	3
153	5.1.2.5(11)	…and bytes shall be transmitted in numerical order.	3
154	5.2.1(1)	The sequence shall begin when a valid SOM pattern is detected by the data controller.	2
155	5.2.1(2)	The data controller shall process the header kernel.	17
156	5.2.1(3)	If the header type field indicates the presence of a header extension, the data controller shall process the header extension as well.	17
157	5.2.1(4)	If the header CRC is invalid or the header destination field does not match the receiving data controller's network ID, the burst shall be discarded.	17
158	5.2.1(5)	If the header CRC and the destination field are valid, the burst type field shall be decoded and acted upon.	17
159	5.2.1(6)	If the burst type is a PB or MPB, the receiving data controller shall send a PA, provided the receiving data controller is not busy…	17
160	5.2.1(7)	…(if it is busy, it shall respond with an RSYNC burst).	17

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
161	5.2.1(8)	If the burst type is a data burst (PTP, BC, or MC burst), the receiving data controller shall process the data packets that follow the header.	17
162	5.2.1(9)	If the PTP, BC, or MC header's No ARQ bit is cleared, the receiving data controller shall formulate and transmit an ACK, as described in 5.4.	17
163	5.2.1(10)	PA and ACK burst processing shall be as specified in 5.1.1.	17
164	5.2.2(1)	If a SOM is detected, the receiving data controller shall begin processing the header.	17
165	5.2.2(2)	Four copies of the kernel and extension (if present) shall be combined and FEC-decoded,…	17
166	5.2.2(3)	…and the header CRC shall be checked.	17
167	5.2.2(4)	If the CRC or the destination ID are invalid, the burst shall be discarded.	17
168	5.2.2(5)	Otherwise, the header information shall be interpreted to determine the content of the burst.	17
169	5.2.2(6)	When ARQ is disabled, encoded data packets shall be assembled and, for code rates other than 1, FEC-decoded.	17
170	5.2.2(7)	The decoded packets shall then be decompressed, if necessary, to retrieve the transmitted message.	17
171	5.2.2(8)	If the format of the current burst is different than the previous burst, encoded packets shall be FEC-decoded, and previously received packets, if any, should be discarded.	17
172	5.2.2(9)	A CRC shall also be performed on the decoded packets when ARQ is enabled.	17
173	5.2.2(10)	Correctly received packets shall then be decompressed, if necessary, to retrieve the transmitted information.	17
174	5.2.2(11)	Once a burst has been processed, an ACK shall be sent, as described in 5.3.1.	17
175	5.2.2(12)	The ACK shall identify any packets in error, as described in 4.5.1, and the desired code rate as determined by the receiving data controller.	17
176	5.2.2(13)	Channel quality shall be determined and mapped to one of the four possible code rates: 1/2, 3/4, 7/8, or 1.	17
177	5.2.2(14)	The desired code rate shall then be sent to the transmitting data controller, using the Requested Code Rate field of the ACK header.	17

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
178	5.2.2.1	SOM detection shall not degrade system performance below the minimum performance defined in 5.5.	2, 17
179	5.2.2.2(1)	The burst type field of the decoded kernel shall indicate the existence of a header extension.	17
180	5.2.2.2(2)	If so, the extension repeats shall be combined and FEC-decoded.	17
181	5.2.2.2(3)		

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
194	5.2.2.5(2)	For PTP bursts, the ACK field of the ACK header extension shall contain a bit for each packet in the last acknowledged burst.	32
195	5.2.2.5(3)	Bits shall be set by the receiving data controller to indicate to the transmitting data controller those packets received in error.	32
196	5.2.2.5(4)	The receiving data controller shall use this information to distinguish between new and retransmitted packets.	32
197	5.2.2.5(5)	For MC bursts, the Packet Repeats field of the MC burst header shall identify to all destinations those packets in the last acknowledged burst that are being retransmitted.	32
198	5.2.2.5(6)	The receiving data controller shall use this information to distinguish between new and retransmitted packets.	32
199	5.2.2.5(7)	When ARQ is enabled, the CRC and any flush bits shall be stripped from the packets,…	32
200	5.2.2.5(8)	…and the receiving data controller shall use information in the ACK or MC header to correctly reassemble the transmitted message.	32
201	5.2.2.5(9)	If the last packet is stuffed, as indicated by the appropriate bit in the header, it shall be unstuffed prior to reassembling the message.	32
202	5.2.2.5(10)	This shall be done by deleting the last byte in the packet and all immediately preceding bytes identical to it.	32
203	5.2.2.5(11)	Reassembled packets shall be decompressed, if necessary.	32
204	5.2.2.6(1)	The decompression algorithm shall be interoperable with the decompression algorithm described in [BELL 86].	12
205	5.2.2.6(2)	The decompression parameters used shall be the same as the compression parameters listed in table I [of the MIL-STD].	12
206	5.2.2.6(3)	The compression bit in the PTP, BC, and MC headers shall indicate to the receiving data controller whether or not the message was compressed.	12
207	5.2.2.6(4)	Decompression shall be bypassed for uncompressed data.	1
208	5.3.1.1(1)	ARQ shall provide the acknowledgment protocol for error-free message delivery of PTP messages.	1

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
209	5.3.1.1(2)	ARQ shall be enabled on a message-by-message basis by the transmitting data controller.	1
210	5.3.1.1(3)	The No ARQ bit, in the header, shall be cleared, indicating that the ARQ protocol is enabled. See 5.4.1 through 5.4.7 for header details.	1
211	5.3.1.1(4)	When ARQ is enabled, the transmitting data controller shall append a CRC to each packet of the transmitted message.	6
212	5.3.1.1(5)	The receiving data controller shall use the CRC to determine if packets were received in error.	23
213	5.3.1.1(6)	The receiving data controller shall respond to the transmitting data controller with an ACK, as described in 4.5.1.1.	23
214	5.3.1.1(7)	When ARQ is disabled, the transmitting data controller shall set the header No ARQ bit…	1
215	5.3.1.1(8)	…and shall not append a CRC to the transmitted packets.	1
216	5.3.1.1(9)	An RSYNC shall be sent in lieu of an ACK for such errors.	25
217	5.3.1.1.1	Upon receipt of PTP burst, the receiving data controller shall format and send an ACK within the turnaround time specified in table V [of the MIL-STD].	28
218	5.3.1.1.2(1)	The ACK delay shall be measured from the end of the transmitted burst to the receipt of the last bit of the ACK header kernel.	29
219	5.3.1.1.2(2)	If the ACK delay exceeds the ACK timeout period, specified in table VI [of the MIL-STD], the transmitting data controller shall timeout and resend the burst, except as specified in 5.3.1.1.3.	29
220	5.3.1.1.3(1)	The previous burst shall be retransmitted if an ACK is not received within the timeout period, without incrementing the burst ID.	29
221	5.3.1.1.3(2)	The data controller shall retransmit until an ACK is received or a maximum number of retries is exceeded.	8
222	5.3.1.1.3(3)	The message shall be aborted and the operator should be notified if the maximum number of retries is exceeded.	8

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
223	5.3.1.2(1)	As described in 4.5.1.2, the MC acknowledgment protocol shall provide explicit polled scheduling of acknowledgment times.	30
224	5.3.1.2(2)	Each of the MC destinations shall respond in a different time slot following the end of the MC or MPB burst.	30
225	5.3.1.2(3)	There shall be one acknowledgment time slot for each MC destination.	30
226	5.3.1.2(4)	The time slots shall be arranged in ascending order by address.	30
227	5.3.1.2(5)	The lowest of the specified destinations shall transmit its ACK in the first slot, followed by the next lowest in the second slot, and so on.	30
228	5.3.1.2(6)	During message transmission, destinations may be removed from the list of destinations; therefore, the MC header shall be interpreted on a burst-by-burst basis.	7
229	5.3.1.2(7)	The MC ACK can be enabled or disabled and shall be selected, based on the No ARQ bit in the MC header, on a message-by-message basis.	1
230	5.3.1.2(8)	When ARQ is disabled, the transmitting data controller shall not append a CRC to the transmitted packets.	1
231	5.3.1.2.1(1)	The ACK slot period for single-hop, secure, UHF SATCOM channels shall be as defined in table VII [of the MIL-STD].	30
232	5.3.1.2.1(2)	Transmissions shall be prohibited during this guard time.	30
233	5.3.1.2.1(3)	The slot times shall be referenced to the receiving data controller, as illustrated in figure 21 [of the MIL-STD] (see section 5.5.1).	30
234	5.3.1.2.1(4)	The first slot shall begin at the end of the received MC burst.	30
235	5.3.1.2.2(1)	In the event that a receiving data controller does not respond with an ACK, the transmitting data controller shall time-out…	8
236	5.3.1.2.2(2)	…and the previous MC burst shall be retransmitted, without incrementing the burst ID.	8
237	5.3.1.2.2(3)	If after consecutive retransmissions, greater than the Maximum Number of Retries, an ACK is still not received, the transmitting data controller shall remove the non-responding data controller(s) from the list of destinations for the current message and should notify the operator.	7

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
238	5.3.1.2.2(4)	The timeout values for MC ACKs on a single-hop, secure, UHF SATCOM channel shall be as defined in table VIIIa [of the MIL-STD].	30
239	5.3.2(1)	Prior to transmitting a new message, the data controller shall determine that the channel is idle, as described in 5.3.2.1.	26
240	5.3.2(2)	In addition, prior to transmitting message bursts or channel probes, data controllers shall comply with the backoff algorithm described in 5.3.2.2.	27
241	5.3.2.1(1)	For messages for which probing is not enabled, the fixed period shall be at least equal to the first slot timeout value specified in table VIIIa [of the MIL-STD].	27
242	5.3.2.1(2)	If channel probing is enabled, the length of the fixed period shall depend on channel traffic.	27
243	5.3.2.1(3)	If channel traffic cannot be decoded (processed in accordance with this MIL-STD), the fixed period shall be equal to the ninth slot timeout value specified in table VIIIa [of the MIL-STD].	27
244	5.3.2.1(4)	If channel traffic can be decoded, the fixed period shall be in accordance with table VIIIb [of the MIL-STD].	27
245	5.3.2.2(1)	When channel activity is detected during the backoff period, the data controller shall exit the backoff protocol and wait for the channel to become inactive.	27
246	5.3.2.2(2)	If channel probing is not enabled, the first message burst backoff period, in msec, shall be based on a uniformly distributed random number between 0 and 4 seconds.	27
247	5.3.2.2(3)	Subsequent bursts, of the same message, shall employ random backoff periods only if unexpected channel activity is detected.	27
248	5.3.2.2(4)	For these bursts the random backoff period, in msec, shall be based on a uniformly distributed random number between 0 and 1 second.	27
249	5.3.2.2(5)	If channel probing is enabled, the backoff period shall be based on a uniformly distributed random number, in msec, within a range from 0 to 2^b seconds, where *b* is called the backoff count.	27
250	5.3.2.2(6)	The backoff count, for the first message probe, initially shall be 1…	27
251	5.3.2.2(7)	…and shall be incremented by 1 each time an attempt to capture the channel is unsuccessful.	27

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
252	5.3.2.2(8)	Each time the backoff count is incremented, a new, uniformly distributed random number between 0 and 2^b x 1000 msec shall then be computed.	27
253	5.3.2.2(9)	If, for the rate in use, 2^b x 1000 exceeds the maximum backoff period specified in table IX [of the MIL-STD], the value in the table shall be the upper bound for the random number selected.	27
254	5.3.2.2(10)	This process shall be repeated until an attempt to capture the channel is successful or the maximum attempts to capture the channel have been attempted.	27
255	5.3.2.2(11)	For PTP services, when the maximum backoff interval or maximum attempts to capture the channel have been reached, the data controller shall abandon the message and should notify the operator.	27
256	5.3.2.2(12)	For MC services, if all destinations are non-responsive, and the maximum backoff interval or the maximum attempts to capture the channel have been reached, the data controller shall abandon the message and should notify the operator.	27
257	5.3.2.2(13)	Upon completing this process, those destinations remaining non-responsive shall be removed from the list of destination addresses, and the operator should be notified.	7
258	5.3.3(1)	Although the DC waveform provides separate fields for selection of code rate and packet size, the waveform defined by this military standard (MIL-STD) shall use fixed mapping, as shown in table X [of the MIL-STD].	11
259	5.3.3(2)	The transmitting data controller shall specify the code rate and packet size in the Code Rate and Packet Size fields of the PTP, BC, and MC headers.	11
260	5.3.3(3)	The receiving data controller shall estimate the channel quality upon receiving a PTP or MC burst and map this quality to a desired code rate, as indicated in table XI [of the MIL-STD].	10
261	5.3.3(4)	The receiving data controller shall use sufficient hysteresis to prevent the code rate from oscillating between two rates when the bit error ratio (BER) is near a threshold.	10
262	5.3.3(5)	The hysteresis shall be large enough to meet the performance defined in section 5.5, when operating with a transmitting data controller that immediately adapts to the requested code rate.	10

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
263	5.3.3(6)	When the receiving data controller responds to the transmitting data controller with an	

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
282	5.3.7(14)	This field shall be set to all zeros for a PB.	25
283	5.3.7(15)	The Burst ID field shall be incremented modulo 16 for each new probe sent by the transmitting data controller.	25
284	5.3.7(16)	An RSYNC burst shall be sent instead of an ACK for those conditions specified here.	25
285	5.3.7.1(1)	***Unexpected burst ID.*** This RSYNC code shall identify receipt of an incorrect burst ID.	25
286	5.3.7.1(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	25
287	5.3.7.2(1)	***Unexpected message ID.*** This RSYNC code shall identify receipt of an incorrect message ID.	25
288	5.3.7.2(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	25
289	5.3.7.3(1)	***Repeated message.*** This RSYNC code shall indicate that the receiving data controller has previously received and correctly decoded the message.	25
290	5.3.7.3(2)	Upon receiving this RSYNC code, the transmitting data controller shall determine that the message was correctly received…	25
291	5.3.7.3(3)	…and shall terminate transfer of data to this destination.	25
292	5.3.7.4(1)	***Unexpected source ID.*** This RSYNC code shall identify receipt of a burst from the unexpected source ID.	25
293	5.3.7.4(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	25
294	5.3.7.5(1)	***Receiver lost.*** This RSYNC code shall indicate that the receiving data controller has missed the first burst(s) of a valid transmission, as indicated by the start-of-message flag in the header.	25
295	5.3.7.5(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	25
296	5.3.7.6(1)	***Receiver busy.*** This RSYNC code shall indicate to the transmitting data controller that the receiving data controller is busy.	25

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
297	5.3.7.6(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	25
298	5.3.7.7(1)	***Data terminal non-responsive.*** This RSYNC code shall indicate to the transmitting data controller that the receiving data controller's attached data terminal device will not accept data.	25
299	5.3.7.7(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	25
300	5.3.7.8	***Incompatible packet format.*** This RSYNC code shall not be used in this revision of the MIL-STD.	25
301	5.3.7.9	***Incompatible burst type.*** This RSYNC code shall not be used in this revision of the MIL-STD.	25
302	5.4(1)	Nondefined bits shall be set to zero by the transmitting data controller…	4
303	5.4(2)	…and shall be treated as "don't care" bits by receiving data controllers.	4
304	5.4.1(1)	A PTP header shall be used to send message data to a single destination, with or without an acknowledgment.	22
305	5.4.1(2)	A BC header shall be used to send message data to all network destinations, without an acknowledgment.	22
306	5.4.1a	***Burst Type.*** This 4-bit field shall identify the burst type as PTP and BC, according to table XIII [of the MIL-STD].	22
307	5.4.1b	***No ARQ.*** This bit shall be set when message acknowledgment is not enabled.	22
308	5.4.1c	***Compression.*** This bit shall be set only if message data has been compressed.	22
309	Note for table XII [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	22
310	5.4.1d	***Start-of-Message.*** This bit shall be set for the first burst of a message and cleared for all subsequent bursts of the message.	22

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
311	5.4.1e	***End-of-Message.*** This bit shall be cleared for all bursts except the last burst of a message.	22
312	5.4.1f	***Code Rate.*** This 3-bit field shall specify the FEC code rate used, according to table XIV [of the MIL-STD].	22
313	5.4.1g	***Packet Size.*** This 3-bit field shall specify the number of data bits in a data packet, according to table XV [of the MIL-STD].	22
314	5.4.1h	***De-Stuff.*** This bit shall be set in the last burst of the message if the last packet is stuffed.	22
315	5.4.1i	***Number of Packets.*** This 8-bit field shall indicate the number of data packets in the burst, less 1.	22
316	5.4.1j(1)	***Destination.*** This 8-bit field shall contain the network ID of the message destination.	22
317	5.4.1j(2)	Values from 1 to 64 shall be PTP destinations.	22
318	5.4.1j(3)	The value 255 shall signify BC.	22
319	5.4.1k(1)	***Source.*** This 8-bit field shall contain the network ID of the message source.	22
320	5.4.1k(2)	Values from 1 to 64 shall be valid.	22
321	5.4.1l(1)	***Burst ID.*** This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new burst in the message,…	15, 22
322	5.4.1l(2)	…and it shall be reset to zero for each new message.	15, 22
323	5.4.1m(1)	***Message ID.*** This 4-bit field represents the message counter. It shall be incremented modulo 16 for each new message,…	22
324	5.4.1m(2)	…and it shall remain the same for every burst of the message.	22
325	5.4.1m(3)	Each transmitting data controller shall maintain its own independent message counter.	22
326	5.4.1n(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	22
327	5.4.1n(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	22
328	5.4.1o	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	22
329	5.4.2(1)	An ACK shall be sent in response to a PTP or MC burst.	23
330	5.4.2(2)	This header shall include a header extension, which contains a bit-mapped field for packet acknowledgments.	23

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
331	5.4.2(3)	The length of this field shall be an integer number of bytes…	23
332	5.4.2(4)	…and shall be specified in the header kernel field, Extension ACK Bytes.	23
333	Note for table XVI [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	23
334	5.4.2a.1	***Burst Type.*** This 4-bit field shall identify the burst type as Acknowledgment, according to table XIII [of the MIL-STD].	23
335	5.4.2a.2	***Requested Code Rate.*** This 4-bit field shall specify to the transmitting data controller the desired code rate of the next burst, as given in table XVII [of the MIL-STD].	23
336	5.4.2a.3(1)	***Number of Requested Packets.*** This 3-bit field shall indicate the maximum number of new packets requested by the receiving data controller, in addition to any repeated packets.	23
337	5.4.2a.3(2)	The value in this field shall be interpreted as shown in table XVIII [of the MIL-STD].	23
338	5.4.2a.4(1)	***Extension ACK bytes.*** This 5-bit field shall indicate the number of bytes, *n,* in the ACKs field of the header extension.	23
339	5.4.2a.4(2)	The extension field shall contain between 1 and 256 individual ACK bits.	23
340	5.4.2a.5(1)	***Destination.*** This 8-bit field shall contain the network ID of the burst destination.	23
341	5.4.2a.5(2)	Values from 1 to 64 shall be valid.	23
342	5.4.2a.6(1)	***Source.*** This 8-bit field shall contain the network ID of the burst source.	23
343	5.4.2a.6(2)	Values from 1 to 64 shall be valid.	23
344	5.4.2a.7	***Burst ID.*** This 4-bit field represents the burst count. It shall be set to the burst ID of the data burst being acknowledged.	23
345	5.4.2a.8	***Message ID.*** This 4-bit field represents the message count. It shall be set to the message ID of the data burst being acknowledged.	23
346	5.4.2a.9(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	23
347	5.4.2a.9(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	23
348	5.4.2a.9(3)	The CRC shall be applied to the header kernel and extension.	23

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
349	5.4.2a.10	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	23
350	5.4.2b.1(1)	***ACKs.*** This variable-length field is a sequence of packet acknowledgment bits (bit map). The bit map shall contain an acknowledgment bit for each packet in the previous data burst.	23
351	5.4.2b.1(2)	The first bit shall correspond to the first packet,…	23
352	5.4.2b.1(3)	…and the last bit shall correspond to the last packet.	23
353	5.4.2b.1(4)	A "zero" bit shall signify correct receipt,…	23
354	5.4.2b.1(5)	…and a "one" bit shall signify incorrect receipt.	23
355	5.4.2b.1(6)	Any unused bits of the last byte shall be set to zero.	23
356	5.4.2b.2	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	23
357	5.4.3(1)	MC bursts shall be used to send message data to multiple destinations (up to 10).	24
358	5.4.3(2)	This header shall have an extension that contains 2 bit-mapped fields: the fixed-length Destinations field, and the variable-length Packet Repeats field.	24
359	Note for table XIX [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	24
360	5.4.3a.1	***Burst Type.*** This 4-bit field shall identify the burst type as MC, according to table XIII [of the MIL-STD].	24
361	5.4.3a.2	***No ARQ.*** This bit shall be set when message acknowledgment is not enabled.	24
362	5.4.3a.3	***Compression.*** This bit shall be set only if message data has been compressed.	24
363	5.4.3a.4	***Start-of-Message.*** This bit shall be set for the first burst of a message and cleared for all subsequent message bursts.	24
364	5.4.3a.5	***End-of-Message.*** This bit shall be cleared for all bursts except the last message burst.	24
365	5.4.3a.6	***Code Rate.*** This 3-bit field shall specify the FEC code rate used, according to table XIV [of the MIL-STD].	24
366	5.4.3a.7	*Packet Size.* This 3-bit field shall specify the number of data bits in a data packet, according to table XV [of the MIL-STD].	24

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
367	5.4.3a.8	***De-Stuff.*** This bit shall be set only if the last packet is stuffed.	24
368	5.4.3a.9	***Number of Packets.*** This 8-bit field shall indicate the number of data packets in the burst, less 1.	24
369	5.4.3a.10	***Number of Repeats.*** This 8-bit field shall specify the number of bytes, *n*, in the Packet Repeats field of the header extension.	24
370	5.4.3a.11(1)	***Source.*** This 8-bit field shall contain the network ID of the message source.	24
371	5.4.3a.11(2)	Values from 1 to 64 shall be valid.	24
372	5.4.3a.12(1)	***Burst ID.*** This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new burst in the message,…	24
373	5.4.3a.12(2)	…and it shall be reset to zero for each new message.	24
374	5.4.3a.13(1)	***Message ID.*** This 4-bit field represents the message count. It shall be incremented modulo 16 for each new message,…	24
375	5.4.3a.13(2)	…and it shall remain the same for every burst of the message.	24
376	5.4.3a.13(3)	Each transmitting data controller shall maintain its own independent message counter.	24
377	5.4.3a.14(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	24
378	5.4.3a.14(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	24
379	5.4.3a.14(3)	The CRC shall be applied to the header kernel and extension.	12, 24
380	5.4.3a.15	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	24
381	5.4.3b.1(1)	***Destinations.*** This 64-bit field (8 bytes) specifies the message's multiple-destination network IDs. Each bit in this bit-mapped field shall represent the network ID of a destination (the first bit = ID#1, the second bit = ID #2, and so on).	24
382	5.4.3b.1(2)	No more than 10 bits shall be set for an MC message.	24
383	5.4.3b.2(1)	***Packet Repeats.*** This variable-length field shall be between 1 and 32 bytes long.	24
384	5.4.3b.2(2)	The field shall provide a bit-mapped indication of those packets from the previous burst that are repeated in this burst.	24
385	5.4.3b.2(3)	The bit map shall contain a bit for each packet in the previous data burst.	24
386	5.4.3b.2(4)	The first bit shall correspond to the first packet,…	24
387	5.4.3b.2(5)	…and the last bit shall correspond to the last packet.	24

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
388	5.4.3b.2(6)	A bit shall be set to signify that the packet is repeated in this burst.	24
389	5.4.3b.2(7)	The bit shall be cleared to signify that the packet is not repeated.	24
390	5.4.3b.2(8)	The length of this field shall be as specified in the Number of Repeats field in the kernel header.	24
391	5.4.3b.2(9)	Unused bits in the last byte shall be set to zero.	24
392	5.4.3b.3	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	24
393	5.4.4(1)	The PB shall be used to capture a channel prior to sending PTP bursts.	19
394	5.4.4(2)	PBs also shall be used by data controllers to exchange revision-level information.	19
395	Note for table XX [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	19
396	5.4.4a	***Burst Type.*** This 4-bit field shall identify the burst type as Probe, according to table XIII [of the MIL-STD].	19
397	5.4.4b	***No ARQ.*** This bit shall be set when message acknowledgment is not enabled.	19
398	5.4.4c	***Priority.*** This byte shall be reserved for future use.	19
399	5.4.4d(1)	***Revision Level.*** This 8-bit field shall be used to specify the waveform revision level.	19
400	5.4.4d(2)	This field shall be 0 for data controllers built to this revision of the MIL-STD.	19
401	5.4.4e(1)	***Destination.*** This 8-bit field shall contain the network ID of the burst destination.	19
402	5.4.4e(2)	Values from 1 to 64 shall be valid.	19
403	5.4.4f(1)	***Source.*** This 8-bit field shall contain the network ID of the burst source.	19
404	5.4.4f(2)	Values from 1 to 64 shall be valid.	19
405	5.4.4g	Burst ID. This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new probe.	19
406	5.4.4h	***Message ID.*** This 4-bit field is not used. This field shall be set to all zeros and is reserved for future use.	19
407	5.4.4i(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	19
408	5.4.4i(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	19

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
409	5.4.4j	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	19
410	5.4.5	The PA shall be used to respond to a PB or an MPB.	20
411	Note for table XXI [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	20
412	5.4.5a	***Burst Type.*** This 4-bit field shall identify the burst type as Probe-Acknowledgment, according to table XIII [of the MIL-STD].	20
413	5.4.5b	***Requested Code Rate.*** This 4-bitfield shall specify the desired code rate of the receiving data controller, as given in table XVII [of the MIL-STD].	20
414	5.4.5c	***Revision Level.*** This field shall be 0 for data controllers built to this revision of the MIL-STD.	20
415	5.4.5d(1)	***Destination.*** This 8-bit field shall contain the network ID of the burst destination.	20
416	5.4.5d(2)	Values from 1 to 64 shall be valid.	20
417	5.4.5e(1)	***Source.*** This 8-bit field shall contain the network ID of the burst source.	20
418	5.4.5e(2)	Values from 1 to 64 shall be valid.	20
419	5.4.5f	***Burst ID.*** This 4-bit field represents the burst count. It shall be set to the burst ID of the PB being acknowledged.	20
420	5.4.5g(1)	***Message ID.*** This 4-bit field is not used. This field shall be set to all zeros…	20
421	5.4.5g(2)	…and shall be reserved for future use.	20
422	5.4.5h(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	20
423	5.4.5h(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	20
424	5.4.5i	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	20
425	5.4.6(1)	The MPB shall be used to capture a channel prior to sending an MC burst.	21
426	5.4.6(2)	Like the MC header, this header shall have a bit-mapped extension field that specifies MC destinations.	21
427	5.4.6a.1	**Burst Type.** This 4-bit field shall identify the burst type as MPB, according to table XIII [of the MIL-STD].	21

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
428	Note for table XXII [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	21
429	5.4.6a.2	***No ARQ.*** This bit shall be set when message acknowledgment is not enabled.	21
430	5.4.6a.3	***Priority.*** This byte shall be reserved for future use.	21
431	5.4.6a.4(1)	***Revision Level.*** This 8-bit field shall be used to specify the waveform revision level.	21
432	5.4.6a.4(2)	This field shall be 0 for data controllers built to this revision of the MIL-STD.	21
433	5.4.6a.5(1)	***Source.*** This 8-bit field shall contain the network ID of the burst source.	21
434	5.4.6a.5(2)	Values from 1 to 64 shall be valid.	21
435	5.4.6a.6	***Burst ID.*** This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new probe.	21
436	5.4.6a.7(1)	***Message ID.*** This 4-bit field is not used. This field shall be set to all zeros…	21
437	5.4.6a.7(2)	…and shall be reserved for future use.	21
438	5.4.6a.8(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	21
439	5.4.6a.8(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	21
440	5.4.6a.8(3)	The CRC shall be applied to the header kernel and extension.	21
441	5.4.6a.9	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	21
442	5.4.6b.1(1)	***Destinations.*** This 64-bit field shall specify the message's multiple destination network ID.	21
443	5.4.6b.1(3)	Each bit in this bitmapped field shall represent the network ID of a destination (the first bit = ID #1, the second bit = ID #2, and so on).	21
444	5.4.6b.1(3)	No more than 10 bits shall be set for an MC message.	21
445	5.4.6b.2	***Flush.*** This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	21
446	5.4.7a	***Burst Type.*** This 4-bit field shall identify the burst type as Resynchronization, according to table XIII [of the MIL-STD].	25
447	5.4.7b	***Requested Code Rate.*** This 4-bit field shall specify the desired code rate of the receiving data controller, as given in table XVII [of the MIL-STD].	25

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
448	5.4.7c	***Reason Code.*** This 8-bit field shall be used to specify certain error conditions.	25
449	5.4.7d(1)	***Revision Level.*** This 8-bit field shall be used to specify the waveform revision level.	25
450	5.4.7d(2)	This field shall be revision 0 for data controllers built to this revision of the MIL-STD.	25
451	5.4.7e(1)	***Destination.*** This 8-bit field shall contain the network ID of the burst destination.	25
452	5.4.7e(2)	Values from 1 to 64 shall be valid.	25
453	5.4.7f(1)	***Source.*** This 8-bit field shall contain the network ID of the burst source.	25
454	5.4.7f(2)	Values from 1 to 64 shall be valid.	25
455	5.4.7g	***Burst ID.*** This 4-bit field represents the burst count. It shall be set to the burst ID of the data burst in error.	25
456	5.4.7h	***Message ID.*** This 4-bit field represents the message count. It shall be set to the message ID of the data burst in error.	25
457	5.4.7i(1)	***CRC.*** This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	25
458	5.4.7i(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	25
459	5.4.7j	***Flush***. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	25
460	5.5.1(1)	Performance, defined in 5.5.2, shall be based on the average time to transfer a long (100,000-byte) and a short (5,000-byte) message error-free over a secure, UHF SATCOM channel.	31
461	5.5.1(2)	Performance shall be averaged over four messages at the channel BER defined in 5.5.2.	31
462	5.5.1(3)	Five messages shall be sent at each BER,…	31
463	5.5.1(4)	…and the average shall be calculated based on the four lowest measurements.	31
464	5.5.1(5)	The following shall be used in performance testing: a. a 25-kHz UHF SATCOM channel or simulated 25-kHz channel, b. a UHF SATCOM radio, c. a KY-57 cryptographic device, and d. a data device capable of transmitting and receiving at 19,200 bps.	31

Requirement Number	MIL-STD Paragraph	Requirement Description	Subtest Number
465	5.5.1(6)	However, the performance results in 5.5.2 shall be met by all data controllers on secure, UHF SATCOM channels, regardless of the implementation-specific capabilities chosen.	31
466	5.5.1(7)	With the channel simulator set to the specified BER, and a nominal 250-msec delay, the average transmission time shall not exceed those given in 5.5.2.	31
467	5.5.2(1)	1. End-to-end transmission time shall be defined as the average time to transfer a message error-free, from the first bit out of the transmitting data terminal to the last bit into the receiving data terminal (from point A to point D in figure 21 [of the MIL-STD]).	31
468	5.5.2(2)	2. Over-the-air transmission time shall be defined as the average time required to transfer a message over the channel from one data controller to another (from point B to point C in figure 21 [of the MIL-STD]), including ACKs.	31
469	5.5.2(3)	The short message-transmission times shall be as specified in table XXV [of the MIL-STD] for each code rate and BER identified.	31
470	5.5.2(4)	The transmitted user-message-length (without compression and coding) shall be 5,000 bytes.	31
471	5.5.2(5)	Long message-transmission times shall be as specified in table XXVI [of the MIL-STD].	31
472	5.5.2(6)	The transmitted user-message-length (without compression and coding) shall be 100,000 bytes.	31
473	5.5.2(7)	End-to-end times shall be identical for any message, compressed or uncompressed, that results in 5,000 or 100,000 bytes of user data transferred over the channel.	31

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
BER - Bit Error Ration
bps - bits per second
CRC - Cyclic Redundancy Check
DC - Data Controller
FEC - Forward Error Correction
ID - Identifier
kHz - Kilohertz
LSB - Least Significant Bit
MC - Multicast
MIL-STD - Military Standard
MPB - Multicast Probe Burst
MSB - Most Significant Bit
msec - milliseconds
PA - Probe Acknowledgement
PB - Probe Burst
PTT - Point-to-Point
RSYNC - Resynchronization Burst
SATCOM - Satellite Communications
SOM - Start-of-Message
UHF - ultrahigh frequency

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APPENDIX C

MIL-STD-188-184 TEST PROCEDURES

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C-1 SUBTEST 1. SELECTABLE FEATURES VERIFICATION

C-1.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for selectable features.

C-1.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 1,2,8, 9, 17, 20, 25, 49-52, 63, 65-67, 79, 95, 207-210, 214, 215, 229, and 230.

C-1.3 Test Procedures

a. Test Equipment Required:

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-1.1.

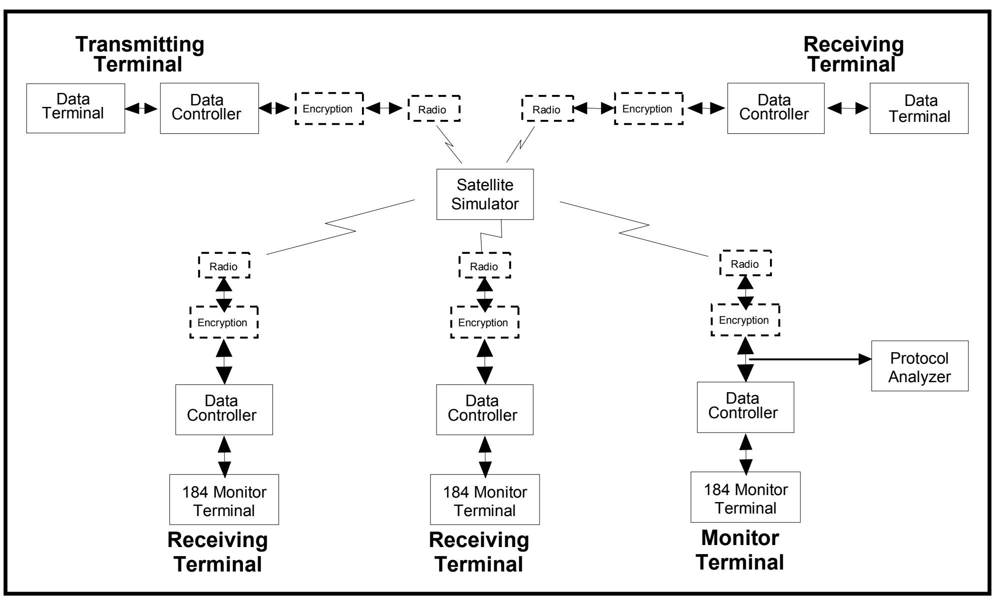

Figure C-1.1. Selectable Features Data Controller Network Configuration

c. Test Conduct

(1) Point-to-Point Message without Probing. The test procedures are listed in table C-1.1.

Table C-1.1. Point-to-Point Message without Probing Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-1.1.	
2	Configure UUT to send a PTP without probe, ACK disabled. Set the UUT ID to 1.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings. To make it easier to identify the CRC in step 8 on the protocol analyzer, have Forward Error Correction (FEC) set to 1.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a message with no ACK (no ARQ).	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_no_probe_ACK_disabled.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_no_probe_ACK_disabled.txt	
8	Verify no probe was sent before the 1st PTP burst, ARQ is off, and no ACK burst is sent. Verify no CRC bits are sent in the PTP burst.	View 184E console. Verify that no ACK was requested by the transmitting terminal and no ACK was transmitted by the receiving terminal. View the protocol analyzer. Verify no CRC bits are applied to the transmitted data field(s). Refer to table C-1.2 for an example of a properly recorded message.	Record results on data collection form D-1.
9	Reconfigure UUT to send a PTP without probe, ACK enabled. Set the UUT ID to 64.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings. To make it easier to identify the CRC in step 13 on the protocol analyzer, have Forward Error Correction (FEC) set to 1.	
10	Send a message without ACK.	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_no_probe_ACK_enabled.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_no_probe_ACK_enabled.txt	
13	Verify no ACK is sent and ARQ is sent. Verify CRC bits are sent	View 184E console. Verify that the ACK was sent by the transmitting terminal and received by the receiving terminal. View the protocol analyzer. Verify CRC bits are transmitted. Refer to table C-1.3 for an example of a properly recorded message.	Record results on data collection form D-1.

Table C-1.1. Point-to-Point Message without Probing Test Procedures (continued)

14	Attempt to reconfigure UUT to send a PTP without probe, ACK enabled, setting the UUT ID to 65.	The UUT should not allow selection of the station ID above 64.	Record results on data collection form D-1.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
ID - Identifier
PTP - Point-to-Point
Txt - Text file extension
UUT - Unit Under Test

Table C-1.2. Point-to-Point Message without Probing, No ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:22:08	PTP	1	2	1	3	BER 0% FEC 1 PACKETS 2 SOM EOM DESTUFF

Legend:
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PTP - Point-to-Point
SOM - Start-of-Message

Table C-1.3. Point-to-Point Message without Probing, with ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
17:44:13	PTP	1	2	1	5	BER 0% FEC 1 PACKETS 2 ARQ SOM EOM DESTUFF
17:44:14	ACK	2	1	1	5	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PTP - Point-to-Point
REQ - Request
SOM - Start-of-Message

(2) Point-to-Point Message with Probing. The test procedures are listed in table C-1.4.

Table C-1.4. Point-to-Point Message with Probing Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-1.1.	
2	Configure UUT to send a PTP with probe, with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings. To make it easier to identify the CRC in step 8 on the protocol analyzer, have Forward Error Correction (FEC) set to 1.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP with probe message (without ARQ).	To be determined when UUT is identified.	

Table C-1.4. Point-to-Point Message with Probing Test Procedures (continued)

Step	Action	Settings/Action	Result
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_with_probe_ACK_disabled.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_with_probe_ACK_disabled.txt	
8	Verify PB, PA, and PTP is sent, but no ACK is returned.	View 184E console. Verify that PTP was sent by the transmitting terminal and no PA was transmitted by the receiving terminal. No ACK should be sent because ACK is disabled. View the protocol analyzer. Verify no CRC bits are applied to the transmitted data field(s). Refer to table C-1.5 for an example of a properly recorded message.	Record results on data collection form D-1.
9	Reconfigure UUT to send a PTP with probe, ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression. settings.	
10	Send a message with a PB (with ARQ).	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_with_probe_ACK_enabled.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_with_probe_ACK_enabled.txt	
13	Verify PB, PA, PTP with ARQ enabled and ACK and ARQ burst are sent. Verify the values of all time intervals meet those required in Tables XII-XXIV of MIL-STD-188-184. Verify the values of all time intervals meet those required in Tables XII-XXIV of MIL-STRD-188-184.	View 184E console. Verify that a PB was sent by the transmitting terminal, a PA was transmitted by the receiving terminal, a PTP was sent by the transmitting terminal, and an ACK was transmitted by the receiving terminal. Refer to table C-1.6 for an example of a properly recorded message.	Record results on data collection form D-1.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MIL-STD - Military Standard
PA - Probe Acknowledgment Burst
PB - Probe Burst
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-1.5. Point-to-Point Message with Probing, No ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
22:00:51	PB	4	3	4	1	BER 0% **ARQ** REV 1 PRI 0
22:00:52	PA	3	4	4	1	REV 3 PRI 0 REQ 1
22:00:54	PTP	4	3	1	4	BER 0% FEC 1 PACKETS 1 SOM EOM DESTUFF

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
SOM - Start-of-Message

Table C-1.6. Point-to-Point Message with Probing, with ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
22:01:24	PB	4	3	5	1	BER 0% **ARQ** REV 1 PRI 0
22:01:25	PA	3	4	5	1	REV 3 PRI 0 REQ 1
22:01:27	PTP	4	3	1	5	BER 0% FEC 1 PACKETS 1 **ARQ** SOM EOM DESTUFF
22:01:28	ACK	3	4	1	5	REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	PRI - Priority
ACK - Acknowledgement Burst	ID - Identifier	PTP - Point-to-Point
ARQ - Automatic Repeat Request	Mesg - Message	REQ - Request
BER - Bit Error Ratio	PA - Probe Acknowledgement Burst	REV - Revision
EOM - End-of-Message	PB - Probe Burst	SOM - Start-of-Message

(3) Multicast Message without Probing. The test procedures are listed in table C-1.7.

Table C-1.7. Multicast Message without Probing Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-1.1.	
2	Configure UUT to send an MC without probing, ACK disabled	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings. To make it easier to identify the CRC in step 8 on the protocol analyzer, have FEC set to 1.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send an MC message with no probe and no ACK.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_no_probe_ACK_disabled.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_no_probe_ACK_disabled.txt	
8	Verify no probe was sent before the 1st PTP burst, ARQ is off, and no ACK and no ARQ burst was sent. Verify no CRC bits are sent in the PTP burst.	View 184E console. Verify that no ACK was requested by the transmitting terminal and no ACK was transmitted by the receiving terminal. View the protocol analyzer. Verify no CRC bits are applied to the transmitted data field(s). Refer to table C-1.8 for an example of a properly recorded message.	Record results on data collection form D-1.
9	Reconfigure UUT to send an MC without probe, ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings. To make it easier to identify the CRC in step 13 on the protocol analyzer, have Forward Error Correction (FEC) set to 1.	

Table C-1.7. Multicast Message without Probing Test Procedures (continued)

10	Send an MC message with no probe and with ARQ to a known good station number.	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_with_probe_ACK_enabled.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_with_probe_ACK_enabled.txt	
13	Verify ACK and ARQ is sent. Verify the values of all time intervals meet those required in Tables XII-XXIV of MIL-STD-188-184.	View 184E console. Verify that the ACK was sent by the transmitting terminal and received by the receiving terminal. Refer to table C-1.9 for an example of a properly recorded message.	Record results on data collection form D-1.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-1.8. Multicast Message without Probing, no ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
17:47:15	MC	1	5 6 7 8 9	1	8	BER 0% FEC 1 REPEATS 0 PACKETS 2 SOM EOM DESTUFF

Legend:
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
SOM - Start-of-Message

Table C-1.9. Multicast Message with Probing, with ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:13:23	MC	1	2 6 7 8 9 10	1	15	BER 0% FEC 1 REPEATS 0 PACKETS 1 ARQ SOM EOM DESTUFF
18:13:23	ACK	2	1	1	15	BER 0% REPEATS 0 REQ 1 FLOW 256
18:13:40	MC	1	6 7 8 9 10	1	15	BER 0% FEC 1 REPEATS 0 PACKETS 1 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
REQ - Request
SOM - Start-of-Message

(4) Multicast Message with Probing. The test procedures are listed in table C-1.10.

Table C-1.10. Multicast Message with Probing Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-1.1.	
2	Configure UUT to send an MC with probing.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send an MC message with probe and ACK.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_with_probe_ACK_enabled.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_with_probe_ACK_enabled.txt	
8	Verify ACK and ARQ was sent. Verify the values of all time intervals meet those required in Tables XII-XXIV of MIL-STD-188-184.	View 184E console. Verify that ACK was requested by the transmitting terminal and ACK was transmitted by the receiving terminal. Refer to table C-1.11 for an example of a properly recorded message.	Record results on data collection form D-1.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
txt - Text File extension
UUT - Unit Under Test

Table C-1.11. Multicast Message with Probing, with ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9 10	1	8	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	1	8	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 1 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgment
REQ - Request
REV - Revision
SOM - Start-of-Message

(5) Compression. The test procedures are listed in table C-1.12, 13, 14.

Table C-1.12. Compression Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-1.1.	
2	Configure UUT to send a PTP without compression.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message with no compression and ACK enabled.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_no_compression.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_no_compression.txt	
8	Verify no compression was used in transmission.	View 184E console. Verify that no compression used by the transmitting terminal and no decompression was used by the receiving terminal. Refer to table C-1.13 for an example of a properly recorded message.	Record results on data collection form D-1.
9	Reconfigure UUT to send PTP with compression and ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
10	Send a PTP message with compression and ACK enabled.	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_with_compression.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_with_compression.txt	
13	Verify compression was used in transmission. Verify the values of all time intervals meet those required in Tables XII-XXIV of MIL-STD-188-184.	View 184E console. Verify that the ACK was sent by the transmitting terminal and received by the receiving terminal. Refer to table C-1.14 for an example of a properly recorded message.	Record results on data collection form D-1.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MIL-STD - Military Standard
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-1.13. Point-to-Point Message without Compression

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
17:44:13	PTP	1	2	1	5	BER 0% FEC 1 PACKETS 2 ARQ SOM EOM DESTUFF
17:44:14	ACK	2	1	1	5	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PTP - Point-to-Point
REQ - Request
SOM - Start-of-Message

Table C-1.14. Point-to-Point Message with Compression

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:53:04	PTP	1	2	1	8	BER 0% FEC 1 PACKETS 2 ARQ LZIV SOM EOM DESTUFF
19:53:04	ACK	2	1	1	8	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
LZIV - Compression Algorithm
Mesg - Message
PTP - Point-to-Point
REQ - Request
SOM - Start-of-Message

C-1.4 Presentation of Results. The results will be shown in a table similar to table C-1.15 indicating the requirement and measured value or indications of capability.

Table C-1.15. Selectable Features Verification Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
1	4.2(1)	Each data controller shall have a unique network ID, operator-selectable to a value from 1 to 64.	Operator-selectable to a value from 1 to 64.	Refer to data collection form D-1.		
17	4.4.1.1	Two types of PTP messages shall be supported: with acknowledgment and without acknowledgment.	Data Controller supports PTP messages with and without acknowledgment.	Refer to data collection form D-1.		
20	4.4.1.3(2)	Two types of Multicast messages shall be supported: with acknowledgment and without acknowledgment.	Data Controller supports MC messages with and without acknowledgment.	Refer to data collection form D-1.		
25	4.5.1	Acknowledgment shall be enabled or disabled on a message-by-message basis, using the No ARQ bit in the header.	Acknowledgment is enabled or disabled on a message-by-message basis, using the No ARQ bit in the header.	Refer to data collection form D-1.		

Table C-1.15. Selectable Features Verification Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
49	4.5.2.2(1)	Probing is selectable on a message-by-message basis and shall be enabled only for channels that provide a return communications path.	Probing is selectable on a message-by-message basis and is enabled only for channels that provide a return communications path.	Refer to data collection form D-1.		
50	4.5.2.2(2)	When probing is enabled, a transmitting data controller shall send a probe to verify that the channel is available prior to sending a PTP or MC message.	When probing is enabled, transmitting data controller sends a probe to verify that the channel is available prior to sending a PTP or MC message.	Refer to data collection form D-1.		
51	4.5.2.2(3)	A PB, addressed to the intended message destination, shall be used for a PTP message.	A PB, addressed to the intended message destination, is used for a PTP message.	Refer to data collection form D-1.		
52	4.5.2.2(4)	An MPB, addressed to the intended message destinations, shall be used for an MC message.	An MPB, addressed to the intended message destinations, is used for an MC message.	Refer to data collection form D-1.		
63	5.1.1(3)	If channel probing (contention resolution) is enabled, the data controller shall transmit a probe burst (PB) or multicast probe burst (MPB) and then wait for a probe acknowledgment burst (PA) from the receiving data controller(s).	Data controller sends PB and waits for a PA from the receiving data controllers.	Refer to data collection form D-1.		

Table C-1.15. Selectable Features Verification Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
65	5.1.1(5)	If a PA is received, or channel probing is not enabled, the data controller shall format and send a data burst.	Data controller formats and sends a data burst.	Refer to data collection form D-1.		
66	5.1.1(6)	If automatic repeat-request (ARQ) operation is not enabled, the data controller shall continue to format and send data bursts until the entire message is transferred.	Data controller continues to send data bursts until message is transferred.	Refer to data collection form D-1.		
67	5.1.1(7)	If ARQ operation is enabled, the data controller shall wait for an acknowledgment burst (ACK).	The data controller waits for an acknowledgment burst.	Refer to data collection form D-1.		
79	5.1.2.1(2)	Compression shall be enabled on a message-by-message basis by the transmitting data controller.	Compression is selectable as enabled or disabled.	Refer to data collection form D-1.		
207	5.2.2.6(4)	Decompression shall be bypassed for uncompressed data.	Decompression is bypassed for uncompressed data.	Refer to data collection form D-1.		
208	5.3.1.1(1)	ARQ shall provide the acknowledgment protocol for error-free message delivery of PTP messages.	Messages are received error free when ARQ is enabled.	Refer to data collection form D-1.		
209	5.3.1.1(2)	ARQ shall be enabled on a message-by-message basis by the transmitting data controller.	ARQ is selectable as enabled or disabled.	Refer to data collection form D-1.		
210	5.3.1.1(3)	The No ARQ bit, in the header, shall be cleared, indicating that the ARQ protocol is enabled. See 5.4.1 through 5.4.7 for header details.	The No ARQ bit is cleared when ARQ is enabled.	Refer to data collection form D-1.		

Table C-1.15. Selectable Features Verification Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
214	5.3.1.1(7)	When ARQ is disabled, the transmitting data controller shall set the header No ARQ bit…	When ARQ is disabled, the transmitting data controller sets the header No ARQ bit.	Refer to data collection form D-1.		
215	5.3.1.1(8)	…and shall not append a CRC to the transmitted packets.	The transmitting data controller does not append a CRC to the transmitted packets.	Refer to data collection form D-1.		
229	5.3.1.2(7)	The MC ACK can be enabled or disabled and shall be selected, based on the No ARQ bit in the MC header, on a message-by-message basis.	ACK is selectable as enabled or disabled based on the ARQ bit.	Refer to data collection form D-1.		
230	5.3.1.2(8)	When ARQ is disabled, the transmitting data controller shall not append a CRC to the transmitted packets.	When ARQ is disabled, the transmitting data controller does not append a CRC to the transmitted packets.	Refer to data collection form D-1.		

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point

C-2 SUBTEST 2. START OF MESSAGE (SOM) VERIFICATION

C-2.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for Start of Message.

C-2.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 8, 9, 138-142, and 154.

C-2.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-2.1.

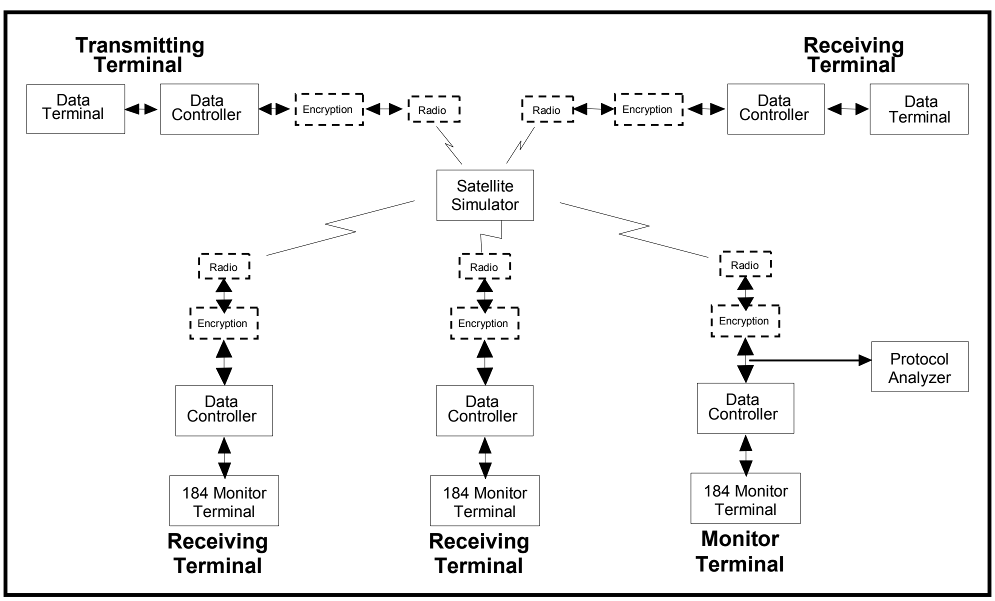

Figure C-2.1. Start-of-Message Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in tables C-2.1-4.

Table C-2.1. Start of Message Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-2.1.	
2	Configure UUT to send a PTP with probe, ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message with probe and with ACK.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\SOM_PTP_ACK_enabled.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ SOM_PTP_ACK_enabled.txt	
8	Verify ACK and ARQ is sent. Verify the SOM is 64 bits in length. Verify the SOM pattern is correct and transmitted without FEC encoding.	View 184E console. Verify that the transmitting terminal requested ACK and ACK was transmitted by the receiving terminal. Verify the SOM is 64 bits in length. Refer to table C-2.2 for an example of a properly recorded message. Refer to table C-2.3 for an example of a properly transmitted SOM.	Record results on data collection form D-2.
9	Reconfigure UUT to send an MC with probe, ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
10	Send an MC message with ACK.	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\SOM_MC_ACK_enabled.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ SOM_MC_ACK_enabled.txt	
13	Verify ACK and ARQ are sent. Verify the SOM is 64 bits in length. Verify the SOM pattern is correct and transmitted without FEC encoding.	View 184E console. Verify that the ACK was sent by the transmitting terminal and received by the receiving terminal. Refer to table C-2.4 for an example of a properly recorded message. Refer to table C-2.3 for an example of a properly transmitted SOM.	Record results on data collection form D-2.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC- Forward Error Correction
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point
SOM - Start-of-Message
Txt - Text file extension
UUT - Unit Under Test

Table C-2.2. Point-to-Point Message with Probing, with ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:22:07	PB	1	2	9	1	BER 0% ARQ REV 1 PRI 0
18:22:07	PA	2	1	9	1	BER 0% REV 1 PRI 0 REQ 1
18:22:08	PTP	1	2	1	3	BER 0% FEC 1 PACKETS 1 ARQ SOM EOM DESTUFF
18:22:08	ACK	2	1	1	3	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	PRI - Priority
ACK - Acknowledgement Burst	ID - Identifier	PTP - Point-to-Point
ARQ - Automatic Repeat Request	Mesg - Message	REQ - Request
BER - Bit Error Ratio	PA - Probe Acknowledgement Burst	REV - Revision
EOM - End-of-Message	PB - Probe Burst	SOM - Start-of-Message

Table C-2.3. Properly Transmitted SOM Example

Type	Byte #1	Byte #2	Byte #3	Byte #4	Byte #5	Byte #6	Byte #7	Byte #8
Binary	10000110	11110010	11100010	10100100	11011101	10101100	01111110	10010000
Hexadecimal	86	f2	e2	a4	dd	ac	7e	90

Table C-2.4. Multicast Message with Probing, with ACK Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9 10	1	8	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	1	8	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 1 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	PA - Probe Acknowledgment
ACK - Acknowledgment Burst	ID - Identifier	PRI - Priority
ARQ - Automatic Repeat Request	MC - Multicast	REQ - Request
BER - Bit Error Ratio	Mesg - Message	SOM - Start-of-Message
EOM - End-of-Message	MPB - Multicast Probe Burst	

C-2.4 Presentation of Results. The results will be shown in a table similar to table C-2. 5 indicating the requirement and measured value or indications of capability.

Table C-2.5. Selectable Features Verification Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
8	4.3.1(1)	The SOM shall be 64 bits long…	64-bit SOM	Refer to data collection form D-1.		
9	4.3.1(2)	…and shall be transmitted without FEC encoding at the beginning of every burst.	SOM has no FEC encoding.	Refer to data collection form D-1.		
138	5.1.2.4(1)	Each burst shall begin with a 64-bit SOM sequence.	SOM is 64 bits.	Refer to data collection form D-1.		
139	5.1.2.4(2)	The SOM shall be transmitted without FEC encoding.	SOM has no FEC encoding.	Refer to data collection form D-1.		
140	5.1.2.4(3)	The SOM sequence shall be as shown below: SOM = 0110000101001111010001110010010110111011001101010111111000001001	SOM sequence is correct.	Refer to data collection form D-1.		
141	5.1.2.4(4)	The sequence shall be transmitted in bit order, left to right.	SOM is transmitted in bit order, left to right.	Refer to data collection form D-1.		
142	5.1.2.4(5)	The SOM shall be sent first, followed by the header, and then the data packets.	SOM is sent first.	Refer to data collection form D-1.		
154	5.2.1(1)	The sequence shall begin when a valid SOM pattern is detected by the data controller.	Data controller shall recognize a proper SOM pattern.	Refer to data collection form D-1.		

Legend:
FEC - Forward Error Correction MIL-STD - Military Standard SOM - Start-of-Message

C-3 SUBTEST 3. HEADER (GENERAL) VERIFICATION

C-3.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for a message header.

C-3.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 10, 11, 143-147, and 151-153.

C-3.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-3.1.

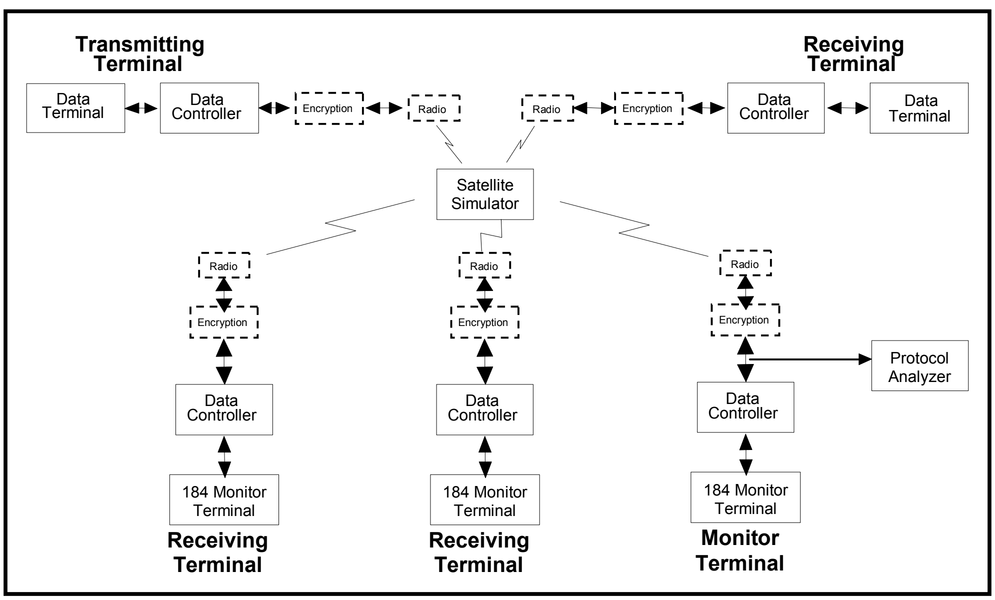

Figure C-3.1. Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-3.1.

Table C-3.1. Header Verification Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-3.1.	
2	Configure UUT to send a PB with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a message with PB (without ARQ).	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Header_Verification.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\Header_Verification.txt	
8	Analyze the header bytes on the 184E console and the header bits on the Protocol Analyzer.	Compare the results to the MIL-STD-188-184 (Table XII) to determine compliance. Remember to read the bits from right to left when checking. Refer to table C-3.2 for an example of a properly transmitted header.	Record results on data collection form D-3.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MIL-STD - Military Standard
PA - Probe Acknowledgment Burst
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-3.2. Header Verification Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:26:37	PB	1	3	10	1	BER 0% ARQ REV 1 PRI 0
18:26:43	PB	1	3	11	1	BER 0% ARQ REV 1 PRI 0

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
ID - Identifier
Mesg - Message
PB - Probe Burst
PRI - Priority
REV - Revision

C-3.4 Presentation of Results. The results will be shown in a table similar to table C-3.3 indicating the requirement and measured value or indications of capability.

Table C-3.3. Header Verification Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
10	4.3.2(1)	Header bit-field definitions shall be as defined in 5.4.	Refer to MIL-STD-188-184 paragraph 5.4.	Refer to data collection form D-3.		

Table C-3.3. Header Verification Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
11	4.3.2(2)	Header structure shall be as defined in 5.1.2.5.	Refer to MIL-STD-188-184 paragraph 5.1.2.5.	Refer to data collection form D-3.		
143	5.1.2.5(1)	In the DC waveform, headers shall be encoded at rate 1/8 to provide a high probability of error-free decoding on noisy channels.	DC waveform is encoded at rate 1/8.	Refer to data collection form D-3.		
144	5.1.2.5(2)	Headers that consist only of a header kernel shall be fixed length.	Headers that consist only of a header kernel are fixed length.	Refer to data collection form D-3.		
145	5.1.2.5(3)	They shall include a fixed-length header kernel and a variable-length header extension, as illustrated in figure 15 [of the MIL-STD].	Refer to MIL-STD-188-184 paragraph 5.1.2.5.	Refer to data collection form D-3.		
146	5.1.2.5(4)	The header shall indicate the existence and length of the header extension.	The header indicates the existence and length of the header extension.	Refer to data collection form D-3.		
147	5.1.2.5(5)	A CRC field and a flush field shall be included with the header.	A CRC field and a flush field are included with the header.	Refer to data collection form D-3.		
151	5.1.2.5(9)	The 24-bit CRC shall then be placed in the CRC field of the header kernel, as specified in figure 15 [of the MIL-STD].	Refer to MIL-STD-188-184 paragraph 5.1.2.5.	Refer to data collection form D-3.		
152	5.1.2.5(10)	The header shall be transmitted LSB first.	The header is transmitted LSB first.	Refer to data collection form D-3.		
153	5.1.2.5(11)	Header bytes shall be transmitted in numerical order.	Bytes are transmitted in numerical order.	Refer to data collection form D-3.		

Legend:
CRC - Cyclic Redundancy Check
DC - Data Controller
LSB - Least Significant Bit
MIL-STD - Military Standard

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C-4 SUBTEST 4. FILL, SPARE, AND STUFFED BITS VERIFICATION

C-4.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for fill, spare, and stuffed bits.

C-4.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 108-110, 302, and 303.

C-4.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-4.1.

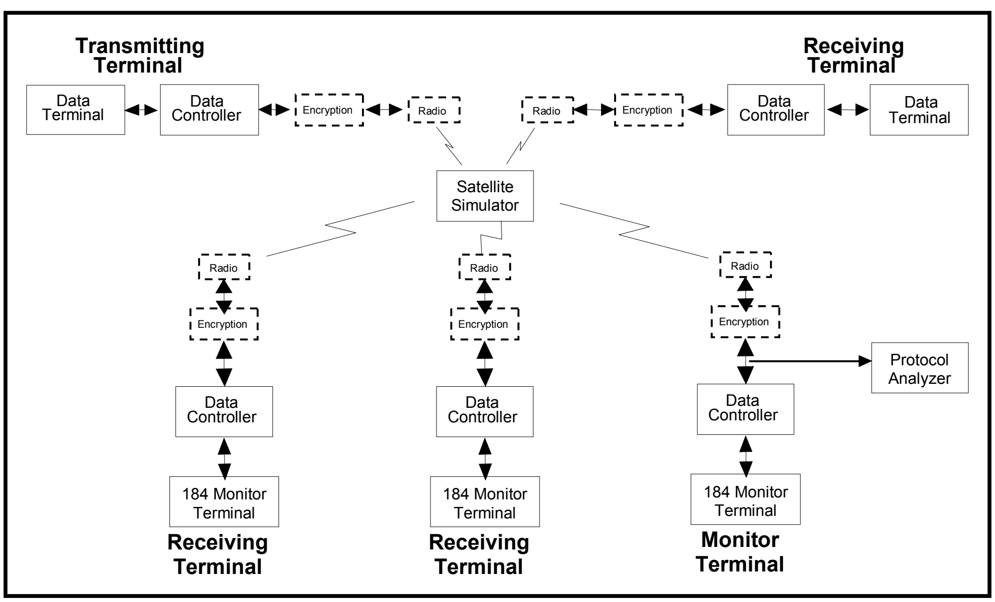

Figure C-4.1. Fill, Spare, and Stuffed Bits Data Controller Network Configuration

c. Test Conduct

(1) Point-to-Point Messages. The test procedures are listed in table C-4.1.

Table C-4.1. PTP Fill, Spare, and Stuffed Bits Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-4.1.	
2	Configure UUT to send a PTP with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a message with PTP (without ARQ) that is 122 bits long.	Setup will be determined when UUT is identified. This message will allow a message to be sent that will not require stuffing at transmission or destuffing at the receiving terminal. The number of bits may vary depending on system under test. Viewing with the protocol analyzer will help determine number of bits to add or subtract.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Fill_PTP_ no_stuff.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Fill_PTP_ no_stuff.txt	
8	Verify that no stuffing is performed on the transmitted message and no destuffing is performed by the receiving terminal.	Refer to table C-4.2 for an example of a properly transmitted header.	

Table C-4.1. PTP Fill, Spare, and Stuffed Bits Test Procedures (continued)

Step	Action	Settings/Action	Result
14	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Fill_PTP_ with_stuff.txt	
15	Verify that stuffing is performed on the transmitted message and destuffing is performed by the receiving terminal.	Refer to table C-4.3 for an example of a properly transmitted header.	Record results on data collection form D-4.
16	Verify the stuffed bits are the inverse of the last bit of the message.	Analyze the traffic log on the protocol analyzer to verify the bits.	Record results on data collection form D-4.
17	Verify that bit 6 in byte 2 of the header is set to notify the receiving terminal to destuff the message.	Analyze the traffic log on the protocol analyzer to verify the bits.	Record results on data collection form D-4.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-4.2. PTP Message with No Bit Stuffing Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	PTP	1	2	1	11	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PTP - Point-to-Point
SOM - Start-of-Message

Table C-4.3. PTP Message with Bit Stuffing Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:45	PTP	1	2	1	12	BER 0% FEC 1 PACKETS 1 SOM EOM DESTUFF

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PTP - Point-to-Point
SOM - Start-of-Message

(2) Broadcast Messages. The test procedures are listed in table C-4.4.

Table C-4.4. BC Fill, Spare, and Stuffed Bits Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-4.1.	
2	Configure UUT to send a BC with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a message with BC (without ARQ) that is 122 bits long.	Setup will be determined when UUT is identified. This message will allow a message to be sent that will not require stuffing at transmission or destuffing at the receiving terminal. The number of bits may vary depending on system under test. Viewing with the protocol analyzer will help determine number of bits to add or subtract.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Fill_BC_ no_stuff.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Fill_BC_ no_stuff.txt	
8	Verify that no stuffing is performed on the transmitted message and no destuffing is performed by the receiving terminal.	Refer to table C-4.5 for an example of a properly transmitted header.	Record results on data collection form D-4.
9	Prepare UUT to send a BC with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
10	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
11	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
12	Send a message with BC (without ARQ) that has fewer than 122 bits.	Setup will be determined when UUT is identified. This message will allow a message to be sent that will require stuffing at transmission and destuffing at the receiving terminal. The number of bits may vary depending on system under test. Viewing with the protocol analyzer will help determine number of bits to add or subtract.	
13	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Fill_BC_ with_stuff.txt	
14	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Fill_BC_ with_stuff.txt	
15	Verify that stuffing is performed on the transmitted message and destuffing is performed by the receiving terminal.	Refer to table C-4.6 for an example of a properly transmitted header.	Record results on data collection form D-4.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
txt - Text file extension
UUT - Unit Under Test

Table C-4.5. BC Message with No Bit Stuffing Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

Table C-4.6. BC Message with Bit Stuffing Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:45	BC	1	255	1	4	BER 0% FEC 1 PACKETS 1 SOM EOM DESTUFF
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

(3) Multicast Messages. The test procedures are listed in table C-4.7.

Table C-4.7. MC Fill, Spare, and Stuffed Bits Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-4.1.	
2	Configure UUT to send an MC with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a message with MC (without ARQ) that is 122 bits long.	Setup will be determined when UUT is identified. This message will allow a message to be sent that will not require stuffing at transmission or destuffing at the receiving terminal. The number of bits may vary depending on system under test. Viewing with the protocol analyzer will help determine number of bits to add or subtract.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Fill_MC_ no_stuff.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Fill_MC_ no_stuff.txt	

Table C-4.7. MC Fill, Spare, and Stuffed Bits Test Procedures (continued)

Step	Action	Settings/Action	Result
8	Verify that no stuffing is performed on the transmitted message and no destuffing is performed by the receiving terminal.	Refer to table C-4.8 for an example of a properly transmitted header.	Record results on data collection form D-4.
9	Prepare UUT to send an MC with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
10	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
11	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
12	Send a message with MC (without ARQ) that has fewer than 122 bits.	Setup will be determined when UUT is identified. This message will allow a message to be sent that will require stuffing at transmission and destuffing at the receiving terminal. The number of bits may vary depending on system under test. Viewing with the protocol analyzer will help determine number of bits to add or subtract.	
13	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Fill_MC_ with_stuff.txt	
14	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Fill_MC_ with_stuff.txt	
15	Verify that stuffing is performed on the transmitted message and destuffing is performed by the receiving terminal.	Refer to table C-4.9 for an example of a properly transmitted header.	Record results on data collection form D-4.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
txt - Text file extension
UUT - Unit Under Test

Table C-4.8. MC Message with No Bit Stuffing Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	MC	1	2 5 6 7 8 9	1	13	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
MC - Multicast
SOM - Start-of-Message

Table C-4.9. MC Message with Bit Stuffing Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:45	MC	1	2 5 6 7 8 9	1	14	BER 0% FEC 1 PACKETS 1 SOM EOM DESTUFF

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
MC - Multicast
SOM - Start-of-Message

C-4.4 Presentation of Results. The results will be shown in a table similar to table C-4.10 indicating the requirement and measured value or indications of capability.

Table C-4.10. Fill, Spare, and Stuffed Bits Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
108	5.1.2.2.1(4)	The last packet of a message shall be stuffed if the packet size does not evenly divide the message length.	Last packet must be stuffed if required.	Refer to data collection form D-4.		
109	5.1.2.2.1(5)	Stuffing shall consist of inverting the last byte of the message and using it to fill the unused bytes in the last packet.	Stuffed bits are inverse of last bit of message.	Refer to data collection form D-4.		
110	5.1.2.2.1(6)	A bit in the PTP, BC, and MC header shall be set to notify the receiving data controller to unstuff the last packet.	Bit must be set to notify the receiving data controller to unstuff the last packet.	Refer to data collection form D-4.		
111	5.1.2.2.1(7)	Byte stuffing is possible because message data received from the data terminal, and compressed data generated by the compression algorithm, shall be an integral number of bytes.	Not testable.			
302	5.4(1)	Non-defined bits shall be set to zero by the transmitting data controller…	Nondefined bits are set to zero by the transmitting data controller.	Refer to data collection form D-4.		
303	5.4(2)	…and shall be treated as "don't care" bits by receiving data controllers.	Nondefined bits are treated as "don't care" bits by receiving data controllers.	Refer to data collection form D-4.		

Legend:
BC - Broadcast Message
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point

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C-5 SUBTEST 5. CODE COMBINING VERIFICATION

C-5.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for fill, spare, and stuffed bits.

C-5.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 192.

C-5.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-5.1.

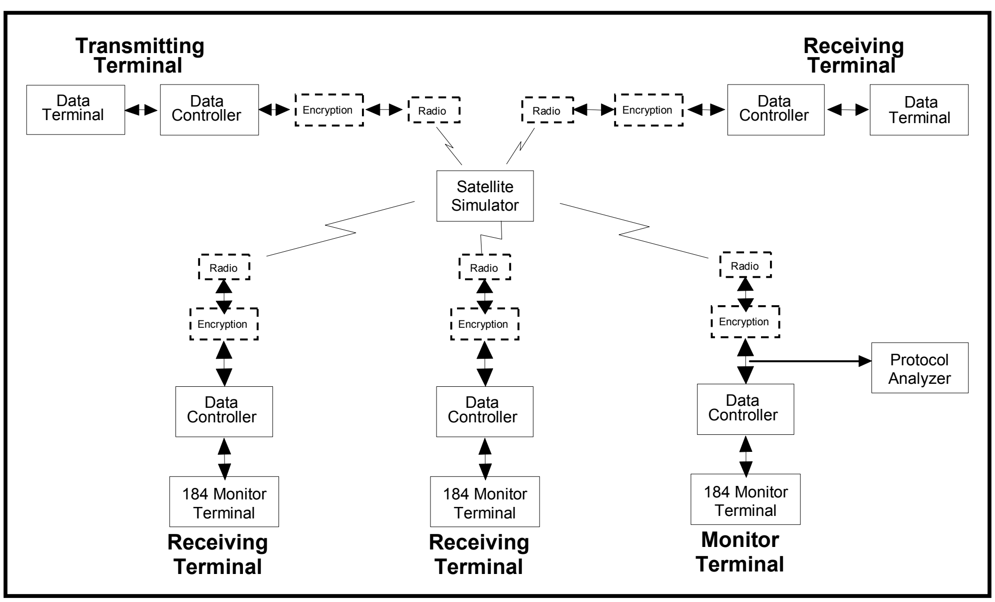

Figure C-5.1. Code Combining Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-5.1.

Table C-5.1. Code Combining Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-5.1.	
2	Configure UUT to send a PTP with ACK disabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Introduce noise on the channel to cause the UUT to transmit a PTP at a FEC rate of 1/2.	Set noise generator create enough noise on the channel in order to force the UUT to use FEC at 1/2 rate.	
5	Send a message with PTP (without ARQ).	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Code_Combining.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Code_Combining.txt	
8	Verify that PTP message is received at 1/2 rate.	Refer to table C-5.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-5.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-5.2. PTP Message Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	PTP	1	2	1	11	BER 0% FEC 1/2 PACKETS 1 SOM EOM

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
ID - Identifier
Mesg - Message
PTP - Point-to-Point
SOM - Start-of-Message

C-5.4 Presentation of Results. The results will be shown in a table similar to table C-5.3 indicating the requirement and measured value or indications of capability.

Table C-5.3. Code Combining Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
192	5.2.2.4(3)	For headers, which are encoded at rate 1/8, four copies of rate 1/2 encoded blocks shall be combined prior to decoding, using a technique called *diversity combining.*	Headers must have four copies of 1/2 rate encoded blocks.	Refer to data collection form D-5.		
Legend: MIL-STD - Military Standard						

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C-6 SUBTEST 6. CYCLIC REDUNDANCY CHECK (CRC) VERIFICATION

C-6.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for CRC.

C-6.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 112-114, 117, 148-149, and 211.

C-6.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-6.1.

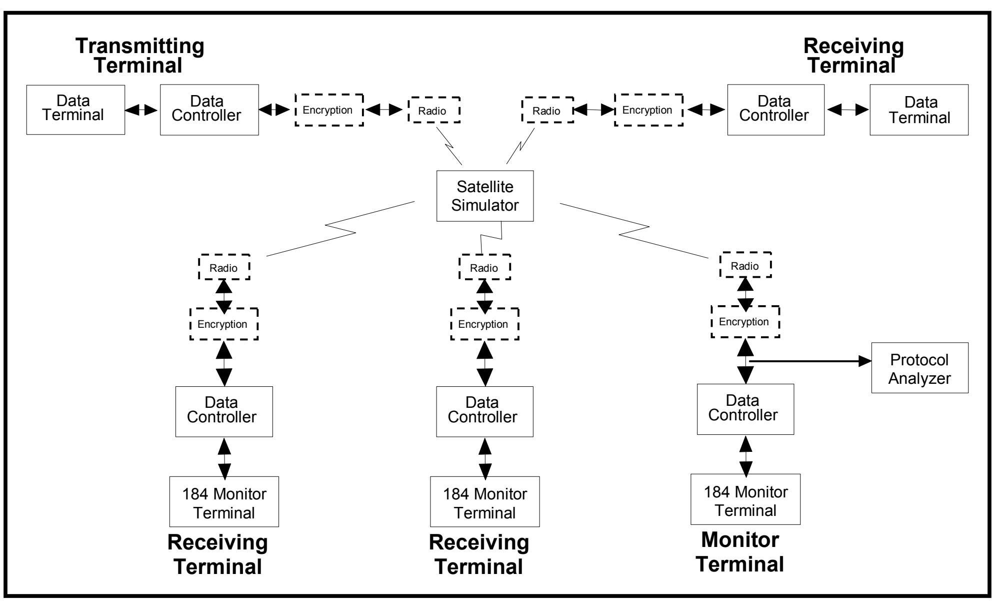

Figure C-6.1. Cyclic Redundancy Check Data Controller Network Configuration

Table C-6.1. CRC Test Procedures (continued)

Step	Action	Settings/Action	Result
16	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Code_Combining_5K_withARQ.txt	
17	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Code_Combining_5K_noARQ.txt	
18	Verify that PTP message is received at 1/2 rate. Run check sum program to verify data in received file matches transmitted file. View the message on the protocol to verify CRC bits are present in the message.	Refer to table C-6.3 for an example of a properly transmitted PTP message.	Record results on data collection form D-6.
19	Send a message with PTP with text file 100-Kbyte.txt attached (with ARQ).	To be determined when UUT is identified.	
20	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Code_Combining_100K_withARQ.txt	
21	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Code_Combining_100K_withARQ.txt	
22	Verify that PTP message is received at 1/2 rate. Run check sum program to verify data in received file matches transmitted file. View the message on the protocol to verify CRC bits are present in the message.	Refer to table C-6.3 for an example of a properly transmitted PTP message.	Record results on data collection form D-6.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
ID - Identifier
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-6.2. PTP Message with No CRC Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	PTP	1	2	1	11	BER 0% FEC 1/2 PACKETS 2 SOM EOM DESTUFF

Legend:
BER - Bit Error Ratio
CRC - Cyclic Redundancy Check
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PTP - Point-to-Point
SOM - Start-of-Message

Table C-6.3. PTP Message with CRC Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	PTP	1	2	1	11	BER 0% FEC 1/2 PACKETS 2 ARQ SOM EOM DESTUFF

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
CRC - Cyclic Redundancy Check
EOM - End-of-Message
ID - Identifier
Mesg - Message
PTP - Point-to-Point
SOM - Start-of-Message

C-6.4 Presentation of Results. The results will be shown in a table similar to table C-6.4 indicating the requirement and measured value or indications of capability.

Table C-6.4. CRC Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
112	5.1.2.2.2(1)	The CRC shall be applied only to the data field.	CRC appends only the data field of a message.	Refer to data collection form D-6.		
113	5.1.2.2.2(2)	The CRC shall be formulated working left to right through *P* information bits, with an initial shift register value of zero.	Message must have CRC when ARQ is enabled.	Refer to data collection form D-6.		
114	5.1.2.2.2(3)	The CRC shall be sent in bit order from left to right, with the first bit in the CRC field being the LSB of the 24-bit CRC (see figure 12 [of the MIL-STD]).	The CRC is sent in bit order from left to right, with the first bit in the CRC field being the LSB of the 24-bit CRC.	Refer to data collection form D-6.		
117	5.1.2.2.2(6)	A CRC shall be appended to the data field only when ARQ is enabled.	A CRC is appended to the data field only when ARQ is enabled.	Refer to data collection form D-6.		
148	5.1.2.5(6)	For fixed-length headers, the CRC shall be computed using only 48-kernel header information bits, as specified in figure 14 [of the MIL-STD].	The CRC is computed using only 48-kernel header information bits.	Refer to data collection form D-6.		
149	5.1.2.5(7)	For headers with an extension, the 24-bit CRC and the 8 flush bits in the kernel shall be initialized to all zeros.	The 24-bit CRC and the 8 flush bits in the kernel is initialized to all zeros.	Refer to data collection form D-6.		
211	5.3.1.1(4)	When ARQ is enabled, the transmitting data controller shall append a CRC to each packet of the transmitted message.	Message must have CRC when ARQ is enabled.	Refer to data collection form D-6.		
Legend: ARQ - Automatic Repeat Request		CRC - Cyclic Redundancy Check LSB - Least Significant Bit		MIL-STD - Military Standard		

C-7 SUBTEST 7. NON-RESPONDING DATA CONTROLLERS VERIFICATION

C-7.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for non-responding data controllers.

C-7.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 228, 237, and 257.

C-7.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-7.1.

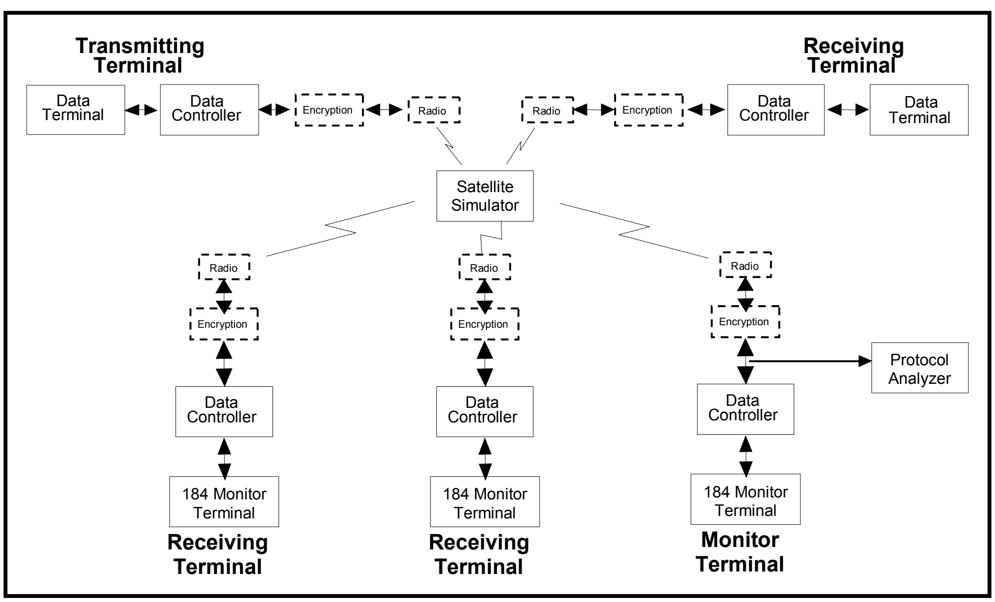

Figure C-7.1. Non-Responding Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-7.1.

Table C-7.1. Non-Responding Data Controller Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-7.1.	
2	Configure UUT to send an MC message with ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send an MC message (with ARQ) to all terminal IDs in the network and to one ID that does not exist.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Non_respondning_terminal.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Non_respondning_terminal.txt	
8	Verify that the MC message is received	Refer to table C-7.2 for an example of a properly transmitted MC message.	Record results on data collection form D-7.
9	View the message on the protocol analyzer to verify that that all terminals provide an ACK.	Refer to table C-7.2 for an example of a properly transmitted MC message.	Record results on data collection form D-7.
10	Verify the terminal ID is removed from the destinations of the next burst once an ACK is received.	Refer to table C-7.2 for an example of a properly transmitted MC message.	Record results on data collection form D-7.
11	Verify the non-existent terminal ID stays on the destination list until the maximum number of retries has been reached. (Refer to Table VIIIa to determine proper timeout times based on the slot number of the terminal ID)	Refer to table C-7.2 for an example of a properly transmitted MC message.	Record results on data collection form D-7.
12	Verify the UUT notifies the operator that the message was aborted	Observe UUT screen. Record notification of aborted message.	Record results on data collection form D-7.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
txt - Text file extension
UUT - Unit Under Test

Table C-7.2. MC Message with Non-Responding Data Controller Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
REQ - Request
SOM - Start-of-Message

C-7.4 Presentation of Results. The results will be shown in a table similar to table C-7.3 indicating the requirement and measured value or indications of capability.

Table C-7.3. Non-Responding Data Controller Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
228	5.3.1.2(6)	During message transmission, destinations may be removed from the list of destinations; therefore, the MC header shall be interpreted on a burst-by-burst basis.	Destinations are removed once ACKs are received.	Refer to data collection form D-7.		
237	5.3.1.2.2(3)	If after consecutive retransmissions, greater than the Maximum Number of Retries, an ACK is still not received, the transmitting data controller shall remove the non-responding data controller(s) from the list of destinations for the current message and should notify the operator.	Destinations are removed once the maximum number of retries has been exceeded.	Refer to data collection form D-7.		
257	5.3.2.2(13)	Upon completing this process, those destinations remaining non-responsive shall be removed from the list of destination addresses, and the operator should be notified.	Nonresponsive terminals are removed from the list of destination addresses, and the operator is notified.	Refer to data collection form D-7.		
Legend: ACK - Acknowledgement Burst; MC - Multicast; MIL-STD - Military Standard						

C-8 SUBTEST 8. MAXIMUM NUMBER OF RETRIES VERIFICATION

C-8.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for maximum number of retries.

C-8.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 28-30, 36, 37, 68-72, 221, 222, 235, and 236.

C-8.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-8.1.

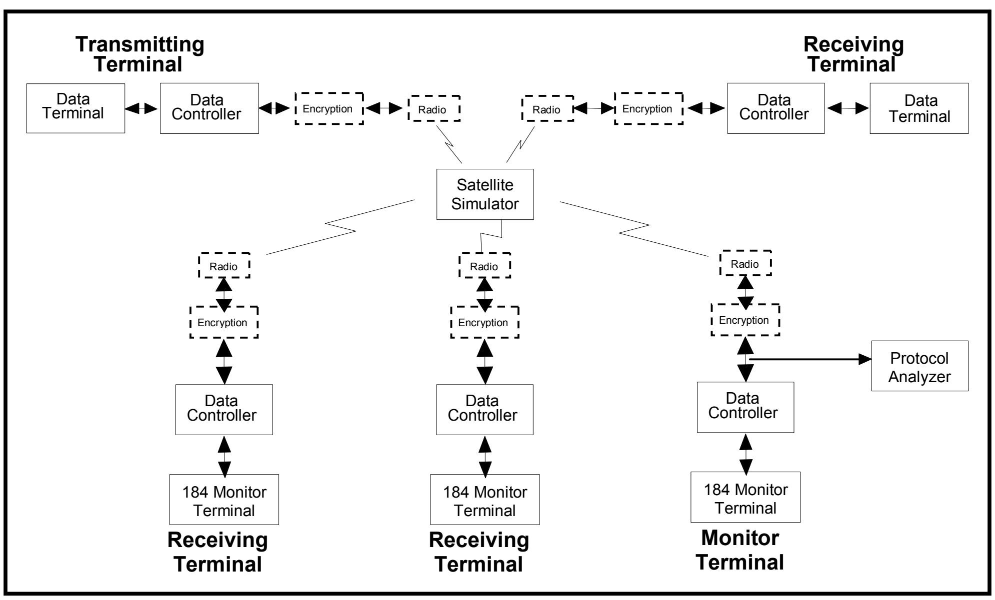

Figure C-8.1. Maximum Number of Retries Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-8.1.

Table C-8.1. Maximum Number of Retries Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-8.1.	
2	Configure UUT to send an MC message with ACK enabled.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send an MC message (with ARQ) to all terminal IDs in the network and to one ID that does not exist.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Max_ retries.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Max_retries.txt	
8	Verify that the MC message is received	Refer to table C-8.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-8.
9	View the message on the protocol analyzer to verify that that all terminals provide an ACK.	Refer to table C-8.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-8.
10	Verify the terminal ID is removed from the destinations of the next burst once an ACK is received.	Refer to table C-8.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-8.
11	Verify the non-existent terminal ID stays on the destination list until the maximum number of retries has been reached.	Refer to table C-8.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-8.
12	Verify MC burst is repeated with same burst and message ID once ACK timeouts are exceeded as shown in table VIIIa.	Refer to table VIIIa of MIL-STD-188-184 for MC slot timeouts.	Record results on data collection form D-8.

Table C-8.1. Maximum Number of Retries Test Procedures (continued)

Step	Action	Settings/Action	Result
13	Verify the UUT notifies the operator that the message was aborted	Observe UUT screen. Record notification of aborted message.	Record results on data collection form D-8.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-8.2. MC Message with Maximum Number of Retries Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowlegement
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
REQ - Request
SOM - Start-of-Message

C-8.4 Presentation of Results. The results will be shown in a table similar to table C-8.3 indicating the requirement and measured value or indications of capability.

Table C-8.3. Maximum Number of Retries Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
28	4.5.1.1.1(1)	If the transmitting data controller does not receive an ACK, it shall time-out, in accordance with 5.3.1.1.	Transmitting terminal times out.	Refer to data collection form D-8.		
29	4.5.1.1.1(2)	…and shall retransmit the last transmitted burst without incrementing the burst ID.	Message is retransmitted without incrementing burst ID.	Refer to data collection form D-8.		
30	4.5.1.1.1(3)	If after consecutive retransmissions, greater than the Maximum Number of Retries, acknowledgment is still not received, the transmitting data controller shall abort the message and should notify the operator.	UUT notification of aborted message is displayed.	Refer to data collection form D-8.		
36	4.5.1.2.1(1)	If the transmitting data controller does not receive an ACK from all destinations, it shall time-out, in accordance with 5.3.1.2,…	Transmitting terminal times out.	Refer to data collection form D-8.		
37	4.5.1.2.1(2)	…and shall retransmit the last burst without incrementing the burst ID.	Message is retransmitted without incrementing burst ID.	Refer to data collection form D-8.		
68	5.1.1(8)	If an ACK is not received within a predetermined amount of time, the data controller shall resend the original data burst with the same burst ID.	Message is retransmitted without incrementing burst ID.	Refer to data collection form D-8.		

Table C-8.3. Maximum Number of Retries Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
69	5.1.1(9)	The data controller shall continue to retransmit the original data burst until either an ACK is received or a maximum number of retries is exceeded.	The data controller continues to retransmit the original data burst until either an ACK is received or a maximum number of retries is exceeded.	Refer to data collection form D-8.		
70	5.1.1(10)	In the event that a maximum number of retries is exceeded, the message shall be aborted, as specified in 5.3.1.1 and 5.3.1.2.	The message is aborted.	Refer to data collection form D-8.		
71	5.1.1(11)	If the ACK is received, the data controller shall format and send the next burst.	The data controller formats and sends the next burst.	Refer to data collection form D-8.		
72	5.1.1(12)	This process shall continue until the entire message is transferred.	Entire message is transferred.	Refer to data collection form D-8.		
221	5.3.1.1.3(2)	The data controller shall retransmit until an ACK is received or a maximum number of retries is exceeded.	The data controller retransmits until an ACK is received or a maximum number of retries is exceeded.	Refer to data collection form D-8.		
222	5.3.1.1.3(3)	The message shall be aborted and the operator should be notified if the maximum number of retries is exceeded.	The message is aborted and the operator is notified.	Refer to data collection form D-8.		

Table C-8.3. Maximum Number of Retries Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
235	5.3.1.2.2(1)	In the event that a receiving data controller does not respond with an ACK, the transmitting data controller shall time-out…	The transmitting data controller times out.	Refer to data collection form D-8.		
236	5.3.1.2.2(2)	…and the previous MC burst shall be retransmitted, without incrementing the burst ID.	The previous MC burst is retransmitted, without incrementing the burst ID.	Refer to data collection form D-8.		

Legend:
ACK - Acknowledgement Burst
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
UUT - Unit Under Test

C-9 SUBTEST 9. RETRANSMISSION VERIFICATION

C-9.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for retransmission.

C-9.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 31-34, 38-40, and 42-47.

C-9.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-9.1.

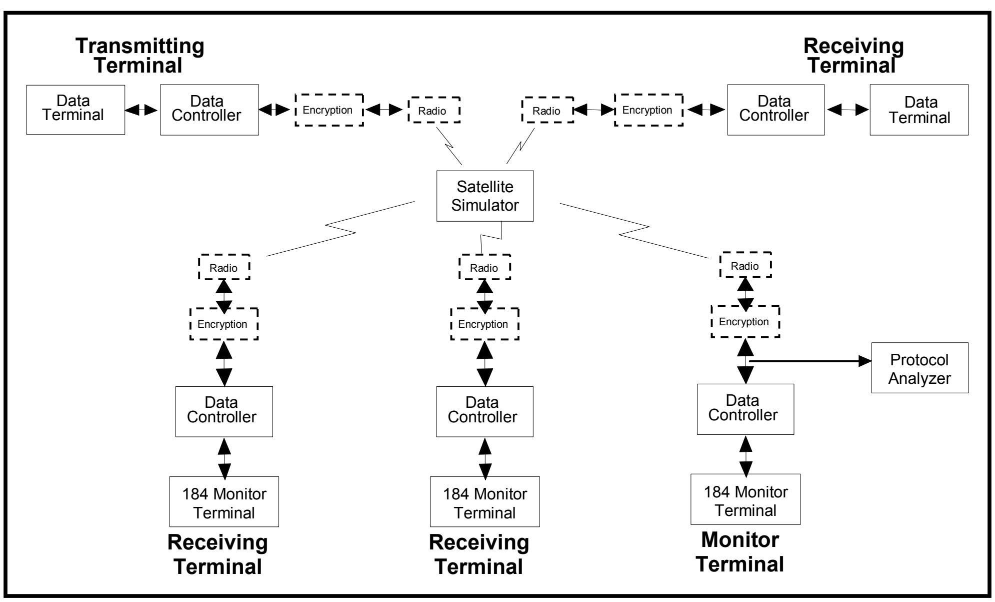

Figure C-9.1. Retransmission Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-9.1.

Table C-9.1. Retransmission Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-9.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Introduce noise on the channel to cause the UUT to transmit a PTP at a FEC rate of 1/2.	Set noise generator to create enough noise on the channel that forces the UUT to use FEC at 1/2 rate.	
6	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
7	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Retransmission_5K.txt	
8	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Retransmission_5K.txt	
9	Verify that the PB, PA, PTP and ACK bursts are received.	Refer to table C-9.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-9.
10	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Retransmission_100K.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ Retransmission_100K.txt	
13	Verify that the PB, PA, PTP and ACK bursts are received.	Refer to table C-9.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-9.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
PA - Probe Acknowlegement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-9.2. Retransmission Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

C-9.4 Presentation of Results. The results will be shown in a table similar to table C-9.3 indicating the requirement and measured value or indications of capability.

Table C-9.3. Retransmission Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
31	4.5.1.1.2(1)	Packets incorrectly received shall be retransmitted first, in the order in which they were originally transmitted.	Packets are retransmitted first, in the order in which they were originally transmitted.	Refer to data collection form D-9.		
32	4.5.1.1.2(2)	The remainder of the burst shall be filled with new packets.	The remainder of the burst is filled with new packets.	Refer to data collection form D-9.		
33	4.5.1.1.2(3)	If the format (code rate and packet size) of the burst is the same as the last burst, only those packets received in error shall be retransmitted.	Message is retransmitted without incrementing burst ID.	Refer to data collection form D-9.		

Table C-9.3. Retransmission Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
34	4.5.1.1.2(4)	If the format of the burst is different from the last burst, all packets after, and inclusive of, the first packet received in error shall be retransmitted as new packets.	All packets after, and inclusive of, the first packet received in error are retransmitted as new packets.	Refer to data collection form D-9.		
38	4.5.1.2.2(1)	Following receipt of acknowledgment bursts, the transmitting data controller shall retransmit packets that were incorrectly received by any acknowledging destinations.	Transmitting data controller retransmits packets that were incorrectly received by any acknowledging destinations.	Refer to data collection form D-9.		
39	4.5.1.2.2(2)	If the current burst format (code rate and packet size) is the same as the last burst, the transmitting data controller shall retransmit the union of all packets received in error.	Transmitting data controller retransmits the union of all packets received in error.	Refer to data collection form D-9.		
40	4.5.1.2.2(3)	If the current burst format is different from the last burst, all data starting with the data in the first packet received in error shall be retransmitted using the new burst format.	All data starting with the data in the first packet received in error is retransmitted using the new burst format.	Refer to data collection form D-9.		
42	4.5.1.2.3(2)	The transmitting data controller shall set the bits of the Packet Repeats field to inform the destinations what packets of the last acknowledged burst are retransmitted.	Transmitting data controller sets the bits of the Packet Repeats field to inform the destinations what packets of the last acknowledged burst are retransmitted.	Refer to data collection form D-9.		

Table C-9.3. Retransmission Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
43	4.5.1.2.3(3)	If the current burst format is different from the last acknowledged burst, all bits in the Packet Repeats field following the first packet in error shall be set.	All bits in the Packet Repeats field following the first packet in error are set.	Refer to data collection form D-9.		
44	4.5.1.2.3(4)	If the current burst format is the same as the last acknowledged burst, only those bits in the Packet Repeats field corresponding to the union of packets received in error shall be set.	Only those bits in the Packet Repeats field corresponding to the union of packets received in error are set.	Refer to data collection form D-9.		
45	4.5.1.2.3(5)	If the union of packets received in error includes all packets of the last acknowledged burst, then all bits in the field shall be set,…	All bits in the field are set.	Refer to data collection form D-9.		
46	4.5.1.2.3(6)	…the burst ID shall be incremented,…	The burst ID is incremented.	Refer to data collection form D-9.		
47	4.5.1.2.3(7)	…and all packets shall be retransmitted.	All packets shall be retransmitted.	Refer to data collection form D-9.		
Legend: ID - Identifier MIL-STD - Military Standard						

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C-10 SUBTEST 10. CHANNEL QUALITY VERIFICATION

C-10.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for channel quality.

C-10.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 7 and 260-264.

C-10.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-10.1.

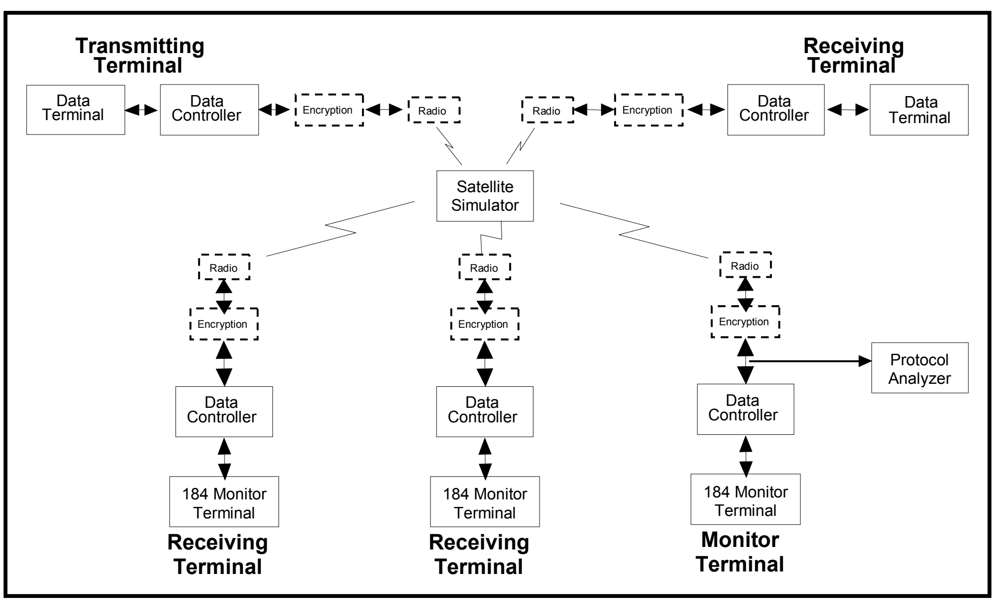

Figure C-10.1. Channel Quality Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-10.1.

Table C-10.1. Channel Quality Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-10.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Introduce noise on the channel to cause the UUT to transmit a PTP at a FEC rate of 1/2.	Set noise generator to create enough noise on the channel that forces the UUT to use FEC at 1/2 rate.	
7	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\Channel_Quality_5K.txt	
8	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Channel_Quality_5K.txt	
9	Verify that the PB, PA, PTP and ACK bursts are received.	Refer to table C-10.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-10.
10	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
11	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Channel_Quality_100K.txt	
12	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_Channel_Quality_100K.txt	
13	Verify that the PB, PA, PTP and ACK bursts are received.	Refer to table C-10.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-10.
14	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
15	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
16	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
17	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
18	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Channel_Quality_5K.txt	

Table C-10.1. Channel Quality Test Procedures (continued)

Step	Action	Settings/Action	Result
19	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_Channel_Quality_5K.txt	
20	Verify that the MPB, PA, MC and ACK bursts are received.	Refer to table C-10.3 for an example of a properly transmitted MC message.	Record results on data collection form D-10.
21	Send an MC message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
22	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Channel_Quality_100K.txt	
23	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_Channel_Quality_100K.txt	
24	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-10.3 for an example of a properly transmitted MC message.	Record results on data collection form D-10.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Reques
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-10.2. PTP Channel Quality Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Reques
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-10.3. MC Channel Quality Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 1 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

C-10.4 Presentation of Results. The results will be shown in a table similar to table C-10.4 indicating the requirement and measured value or indications of capability.

Table C-10.4. Channel Quality Test Results

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
7	4.2.4(2)	FEC shall be adaptive.	FEC is adaptive.	Refer to data collection form D-10.		
260	5.3.3(3)	The receiving data controller shall estimate the channel quality upon receiving a PTP or MC burst and map this quality to a desired code rate, as indicated in table XI [of the MIL-STD].	The receiving data controller requests a FEC rate for the MC burst.	Refer to data collection form D-10.		
261	5.3.3(4)	The receiving data controller shall use sufficient hysteresis to prevent the code rate from oscillating between two rates when the bit error ratio (BER) is near a threshold.	The FEC rate does not oscillate between two rates.	Refer to data collection form D-10.		

Table C-10.4. Channel Quality Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
262	5.3.3(5)	The hysteresis shall be large enough to meet the performance defined in section 5.5, when operating with a transmitting data controller that immediately adapts to the requested code rate.	Transmitting data controller that immediately adapts to the requested code rate.	Refer to data collection form D-10.		
263	5.3.3(6)	When the receiving data controller responds to the transmitting data controller with an ACK, it shall specify the desired code rate in the Requested Code Rate field of the ACK header.	The receiving data controller requests a FEC rate for the MC burst.	Refer to data collection form D-10.		
264	5.3.3(7)	If the receiving data controller is unable to accurately estimate the channel quality, it shall insert the Not Available code in the Requested Code Rate field of the ACK header.	Not Available code is placed in the Requested Code Rate field of the ACK header when channel quality cannot be determined.	Refer to data collection form D-10.		

Legend:
ACK - Acknowledgement Burst
BER - Bit Error Ratio
FEC - Forward Error Correction
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point

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C-11 SUBTEST 11. FORWARD ERROR CORRECTION VERIFICATION

C-11.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for forward error correction (FEC).

C-11.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 6, 57, 118-120, 122-137, 190, 191, 258, and 259.

C-11.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-11.1.

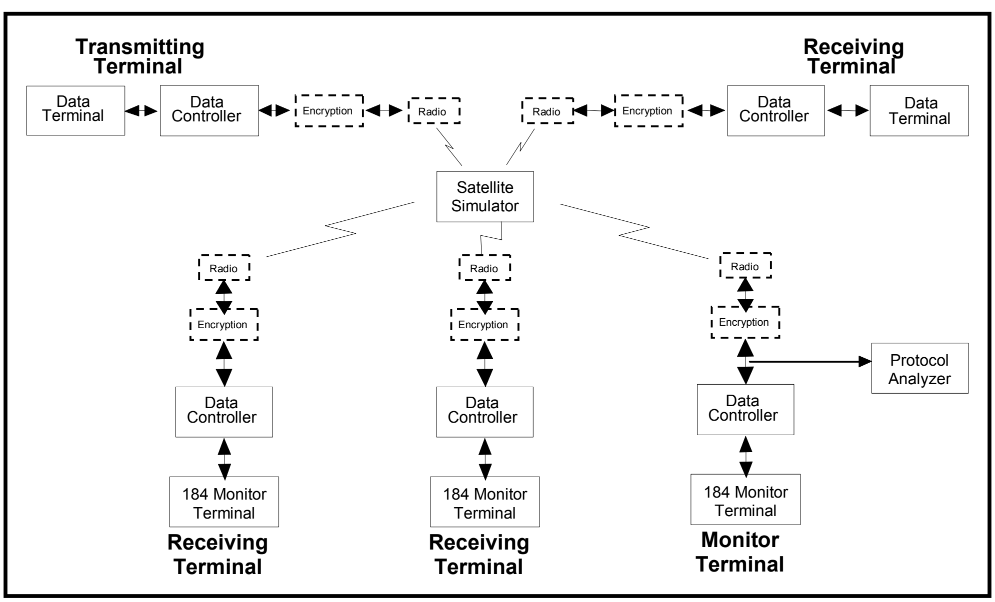

Figure C-11.1. Forward Error Correction Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-11.1.

Table C-11.1. Forward Error Correction Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-11.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Channel_Quality_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_FEC_5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-11.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-11.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_FEC_100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_FEC_100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-11.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-11.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to two terminal IDs in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_FEC_5K.txt	

Table C-11.1. Forward Error Correction Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_FEC_5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-11.3 for an example of a properly transmitted MC message.	Record results on data collection form D-11.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Channel_Quality_100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_FEC_100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-11.3 for an example of a properly transmitted MC message.	Record results on data collection form D-11.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_Channel_Quality_5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_FEC_5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-11.4 for an example of a properly transmitted BC message.	Record results on data collection form D-11.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_FEC_100K.txt	

Table C-11.1. Forward Error Correction Test Procedures (continued)

Step	Action	Settings/Action	Result
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_FEC_100K.txt	
34	Verify that the BC bursts are received.	Refer to table C-11.4 for an example of a properly transmitted BC message.	Record results on data collection form D-11.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte

Table C-11.4. BC Forward Error Correction Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
BC - Broadcast Message
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
SOM - Start-of-Message

C-11.4 Presentation of Results. The results will be shown in a table similar to table C-11.5 indicating the requirement and measured value or indications of capability.

Table C-11.5. Forward Error Correction Test Results

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
6	4.2.4(1)	FEC shall be used, as defined in 5.1.2.3 and 5.2.2.4, to provide improved bit error ratio (BER) performance over noisy communications channels.	FEC is used in transmission.	Refer to data collection form D-11.		
57	4.5.3(3)	When ARQ is enabled, the FEC code rate shall be determined on a burst-by-burst basis, as specified in 5.3.3.	The transmitting data controller indicates the FEC rate in the header.	Refer to data collection form D-11.		
118	5.1.2.2.3(1)	To flush the encoder, the data controller shall append 8 zero bits to the packet prior to FEC encoding, as discussed in 5.1.2.3.	The data controller appends 8 zero bits to the packet prior to FEC encoding	Refer to data collection form D-11.		
119	5.1.2.2.3(2)	Flush bits shall not be appended to rate 1 encoded packets.	Flush bits are not appended to rate 1 encoded packets.	Refer to data collection form D-11.		
120	5.1.2.3(1)	Each received packet (information and flush bits, and CRC bits, if necessary) shall be FEC-encoded prior to transmission at one of the following code rates: 1/2, 3/4, 7/8, or 1.	Packets are FEC-encoded prior to transmission at one of the following code rates: 1/2, 3/4, 7/8, or 1.	Refer to data collection form D-11.		

Table C-11.5. Forward Error Correction Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
122	5.1.2.3(3)	The transmitting data controller shall indicate the FEC code rate to the receiving data controller via a field in the PTP, BC, or MC header, as described in 5.4.1 and 5.4.3.	The transmitting data controller indicates the FEC code rate to the receiving data controller.	Refer to data collection form D-11.		
123	5.1.2.3.1(1)	Convolutional codes shall be used for FEC.	Convolutional codes are used for FEC.	Refer to data collection form D-11.		
124	5.1.2.3.1(2)	The basic code shall be a rate 1/2, constraint length 7 code (denoted $r = 1/2$, $k = 7$).	Not testable			
125	5.1.2.3.1(3)	The code tap positions shall be as shown in figure 13 [of the MIL-STD] and described below.	Not testable			
126	5.1.2.3.1(4)	The encoder shall be initialized to all zeros prior to encoding each header and each packet of data.	Not testable			
127	5.1.2.3.1(5)	The encoder outputs, C0 and C1, shall provide the first and second bits to be transmitted, respectively.	Not testable			
128	5.1.2.3.1(6)	The process of shifting data into the encoder and taking data from the encoder outputs C0 and C1 shall then continue until each of the flush bits marking the end of the block has been shifted into the encoder.	Not testable			
129	5.1.2.3.1(7)	The highest-rate code used for data packets shall be rate 1.	The highest-rate code used for data packets is rate 1.	Refer to data collection form D-11.		
130	5.1.2.3.1(8)	For this rate, the information bits and CRC bits in the packet shall be transmitted without encoding.	The information bits and CRC bits in the packet are transmitted without encoding.	Refer to data collection form D-11.		

Table C-11.5. Forward Error Correction Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
131	5.1.2.3.1(9)	Code rates lower than 1/2 shall be obtained from the basic 1/2 code by repeating blocks of rate 1/2 encoded data.	Not testable			
132	5.1.2.3.2(1)	From the rate 1/2 code, higher rate 3/4 and 7/8 codes shall be constructed by a technique known as *puncturing*.	Not testable			
133	5.1.2.3.2(2)	The puncturing pattern used for these codes shall be as given in table III [of the MIL-STD].	Not testable			
134	5.1.2.3.2(3)	Only those bits identified with a 1 in table III [of the MIL-STD] shall be transmitted.	Not testable			
135	5.1.2.3.2(4)	They are transmitted in pairs, as described above, and shall be transmitted from left to right.	Not testable			
136	5.1.2.3.2(5)	The puncturing pattern shall be reset following the encoding of each separate block (header or packet) of information.	Not testable			
137	5.1.2.3.3	The resulting encoded packet size shall be as specified in table IV [of the MIL-STD].	Code rates match those requirements in table IV [of the MIL-STD].	Refer to data collection form D-11.		
190	5.2.2.4(1)	The decoder shall insert erasure bits in place of the punctured bits prior to decoding, as appropriate for the decoder implementation.	Not testable			

Table C-11.5. Forward Error Correction Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
191	5.2.2.4(2)	However, for rate 7/8 with No ARQ, the 3 bits removed during packet encoding (see 5.1.2.3.3) shall be taken into account.	Not testable			
258	5.3.3(1)	Although the DC waveform provides separate fields for selection of code rate and packet size, the waveform defined by this military standard (MIL-STD) shall use fixed mapping, as shown in table X [of the MIL-STD].	Code rate and packet size match those provided in table X [of the MIL-STD].	Refer to data collection form D-11.		
259	5.3.3(2)	The transmitting data controller shall specify the code rate and packet size in the Code Rate and Packet Size fields of the PTP, BC, and MC headers.	Transmitting data controller shall specify the code rate and packet size in the Code Rate and Packet Size fields of the PTP, BC, and MC headers.	Refer to data collection form D-11.		

Legend:
ARQ- Automatic Repeat Request
BC - Broadcast Message
BER - Bit Error Ratio
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point

C-12 SUBTEST 12. COMPRESSION VERIFICATION

C-12.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for compression.

C-12.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 3, 78, 80-94, and 204-206.

C-12.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-12.1.

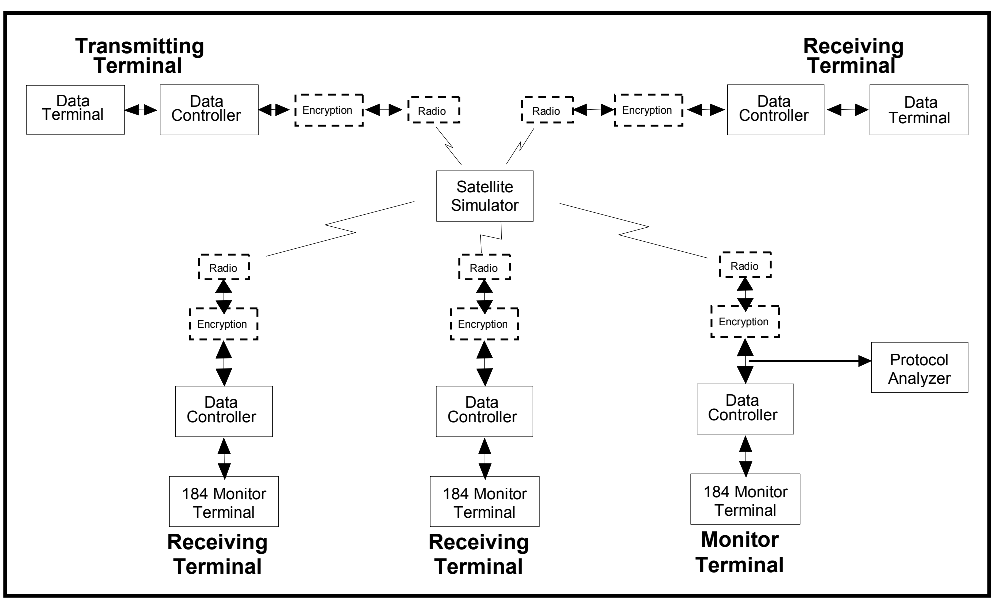

Figure C-12.1. Compression Network Configuration

c. Test Conduct. The test procedures are listed in table C-12.1.

Table C-12.1. Compression Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-12.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Compression_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Compression_5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-12.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-12.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Compression_100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_Compression_100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-12.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-12.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Compression_5K.txt	

Table C-12.1. Compression Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_Compression_5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-12.3 for an example of a properly transmitted MC message.	Record results on data collection form D-12.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Compression_100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_Compression_100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-12.3 for an example of a properly transmitted MC message.	Record results on data collection form D-12.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_Compression_5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_Compression_5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-12.4 for an example of a properly transmitted BC message.	Record results on data collection form D-12.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_Compression_100K.txt	
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_Compression_100K.txt	

Table C-12.1. Compression Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-12.4 for an example of a properly transmitted BC message.	Record results on data collection form D-12.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-12.2. PTP Compression Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-12.3. MC Compression Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 1 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst+
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-12.4. BC Compression Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

C-12.4 Presentation of Results. The results will be shown in a table similar to table C-12.5 indicating the requirement and measured value or indications of capability.

Table C-12.5. Compression Test Results

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
3	4.2.1	A lossless data compression algorithm, interoperable with the algorithm defined in 5.1.2.1 and 5.2.2.6, shall be used to improve throughput.	Compressed messages can be transmitted and received with other data controllers.	Refer to data collection form D-12.		
78	5.1.2.1(1)	The compression bit in the point-to-point (PTP), broadcast (BC), and multicast (MC) headers shall indicate to the receiving data controller whether or not the message data is compressed.	The transmitting data controller indicates whether the data is compressed.	Refer to data collection form D-12.		
80	5.1.2.1(3)	When compression is enabled, a dictionary-based algorithm interoperable with the Lempel-Ziv algorithm [ZIV 77], with extensions described in [BELL 86], shall be used.	Not Testable			
81	5.1.2.1(4)	For the Data Control (DC) waveform, the parameters in table I [of the MIL-STD] shall be used.	DC waveforms meets table I [of the MIL-STD].	Refer to data collection form D-12.		
82	5.1.2.1(5)	For a character codeword, the type field shall be bit position 9, followed by the 8-bit character field.	Not Testable			

Table C-12.5. Compression Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
83	5.1.2.1(6)	For a code-type codeword, the type field shall be bit position 16, followed by an 11-bit pointer field and a 4-bit match length field.	Not Testable			
84	5.1.2.1(7)	The pointer field shall contain the left pointer described in [BELL 86].	Not Testable			
85	5.1.2.1(8)	The match-length field shall contain the longest match, as described in [BELL 86].	Not Testable			
86	5.1.2.1(9)	The match length shall be between 3 (the minimum match length) and 16 (the size of the look ahead buffer).	Not Testable			
87	5.1.2.1(10)	The encoding of match-length values shall be as shown in table II [of the MIL-STD].	Not Testable			
88	5.1.2.1(11)	The 4-bit match-length field has 2 extra binary codes: 1110 shall be used to signal the end-of-file,…	Not Testable			
89	5.1.2.1(12)	…and 1111 shall be reserved for future use.	Not Testable			
90	5.1.2.1(13)	Data generated by the compression algorithm shall be partitioned into 8-bit bytes, beginning with the most significant bit (MSB) of the first codeword and continuing in bit order.	Not Testable			
91	5.1.2.1(14)	The end-of-file code shall be used to indicate the end of the compressed file,	End-of-file code is used to indicate the end of the compressed file	Refer to data collection form D-12.		
92	5.1.2.1(15)	…and unused data bits in the last byte shall be considered "don't care."	Unused data bits in the last byte is considered "don't care."	Refer to data collection form D-12.		

Table C-12.5. Compression Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
93	5.1.2.1(16)	The match length shall also be set to zero for an end-of-file codeword.	The match length is set to zero for an end-of-file codeword.	Refer to data collection form D-12.		
94	5.1.2.1(17)	The compressed data shall then be transmitted in bit order from left to right, starting with the least significant bit (LSB) of the first byte and continuing in byte order, as shown in figure 12 [of the MIL-STD] and described in 5.1.2.2.	The compressed data is transmitted as shown in figure 12 [of the MIL-STD].	Refer to data collection form D-12.		
204	5.2.2.6(1)	The decompression algorithm shall be interoperable with the decompression algorithm described in [BELL 86].	The decompression algorithm is interoperable	Refer to data collection form D-12.		
205	5.2.2.6(2)	The decompression parameters used shall be the same as the compression parameters listed in table I [of the MIL-STD].	Not Testable			
206	5.2.2.6(3)	The compression bit in the PTP, BC, and MC headers shall indicate to the receiving data controller whether or not the message was compressed.	The compression bit indicates to the receiving data controller whether or not the message was compressed.	Refer to data collection form D-12.		

Legend:
BC - Broadcast Message
DC - Data Controller
LSB - Least Significant Bit
MC - Multicast
MIL-STD - Military Standard
MSB - Most Significant Bit
PTP - Point-to-Point

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C-13 SUBTEST 13. PACKET STRUCTURE VERIFICATION

C-13.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for packet structure.

C-13.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 4, 12-15, 55, 56, and 96-107.

C-13.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-13.1.

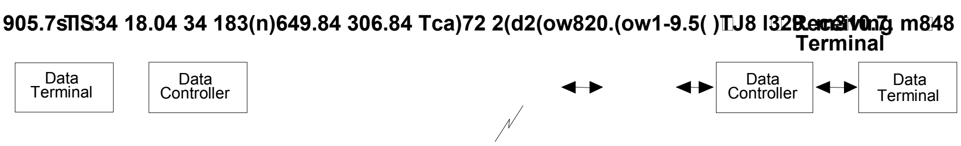

Figure C-13.1. Packet Structure Network Configuration

c. Test Conduct. The test procedures are listed in table C-13.1.

Table C-13.1. Packet Structure Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-13.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Packet_Structure_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Packet_Structure_5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-13.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-13.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Packet_Structure_100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_Packet_Structure_100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-13.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-13.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Packet_Structure_5K.txt	

Table C-13.1. Packet Structure Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_Packet_Structure_5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-13.3 for an example of a properly transmitted MC message.	Record results on data collection form D-13.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_Packet_Structure_100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_Packet_Structure_100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-13.3 for an example of a properly transmitted MC message.	Record results on data collection form D-13.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_Packet_Structure_5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_Packet_Structure_5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-13.4 for an example of a properly transmitted BC message.	Record results on data collection form D-13.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_Packet_Structure_100K.txt	
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_Packet_Structure_100K.txt	

Table C-13.1. Packet Structure Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-13.4 for an example of a properly transmitted BC message.	Record results on data collection form D-13.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-13.2. PTP Packet Structure Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-13.3. MC Packet Structure Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-13.4. BC Packet Structure Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
BC - Broadcast Message
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
SOM - Start-of-Message

C-13.4 Presentation of Results. The results will be shown in a table similar to table C-13.5 indicating the requirement and measured value or indications of capability.

Table C-13.5. Packet Structure Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
4	4.2.2	Long messages shall be split into packets.	The transmitting data controller splits long messages into packets.	Refer to data collection form D-13.		
12	4.3.3(1)	User data shall be grouped into data packets for transmission.	Data is grouped into data packets for transmission.	Refer to data collection form D-13.		
13	4.3.3(2)	The number of user data bits in each packet and the chosen FEC rate shall vary in accordance with this military standard.	Data bits in each packet and the chosen FEC rate vary.	Refer to data collection form D-13.		
14	4.3.3(3)	All packets in a single burst shall have the same length and use the same FEC rate, as described in 5.3.3.	Transmitted packets are the same length and FEC in the burst.	Refer to data collection form D-13.		
14	4.3.3(3)	All packets in a single burst shall have the same length and use the same FEC rate, as described in 5.3.3.	Packets in a single burst have the same length and use the same FEC rate	Refer to data collection form D-13.		
15	4.3.3(4)	The number of packets per data burst shall be from 1 to 256.	The number of packets per data burst are from 1 to 256.	Refer to data collection form D-13.		

Table C-13.5. Packet Structure Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
55	4.5.3(1)	Allowable code rate and packet sizes shall be as listed in 5.3.3.	Code rate and packet sizes are as listed in 5.3.3.	Refer to data collection form D-13.		
56	4.5.3(2)	FEC code rate and packet size shall be indicated through the PTP, BC, and MC header Code Rate and Packet Size fields, as described in 5.4.1 and 5.4.3.	FEC code rate and packet size are indicated through the header Code Rate and Packet Size fields	Refer to data collection form D-13.		
96	5.1.2.2(1)	Messages are transmitted as data bursts. Each burst shall contain a maximum of 256 data packets.	Each burst contains a maximum of 256 data packets.	Refer to data collection form D-13.		
97	5.1.2.2(2)	Data bits to be transmitted shall be grouped into individually decodable data packets.	Data bits are grouped into individually decodable data packets.	Refer to data collection form D-13.		
98	5.1.2.2(3)	Each packet shall have a data field that contains a fixed number of data bits,…	Each packet has a data field that contains a fixed number of data bits.	Refer to data collection form D-13.		
99	5.1.2.2(4)	…and, when necessary, the data field shall be followed by a CRC field for error detection and a flush field that contains encoder flush bits.	Data field is followed by a CRC field for error detection and a flush field that contains encoder flush bits.	Refer to data collection form D-13.		
100	5.1.2.2(5)	All packets in a burst shall have the same number of data bits…	All packets in a burst have the same number of data bits.	Refer to data collection form D-13.		
101	5.1.2.2(6)	…and shall be FEC-encoded at the same rate; however, packet sizes and FEC may vary from burst to burst.	Packets are FEC-encoded at the same rate.	Refer to data collection form D-13.		

Table C-13.5. Packet Structure Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
102	5.1.2.2(7)	Data packet sizes shall be *P* = 512, 760, 864, or 1024 data bits.	Packet sizes are *P* = 512, 760, 864, or 1024 data bits.	Refer to data collection form D-13.		
103	5.1.2.2(8)	The transmitting data controller shall select the packet size and FEC code rate and indicate this to the receiving data controller by fields in the PTP, BC, or MC header.	Packet size and FEC code rate are indicate to the receiving data controller by fields in the PTP, BC, or MC header.	Refer to data collection form D-13.		
104	5.1.2.2(9)	When ARQ is enabled, the transmitting data controller shall select the packet size and FEC code rate, based on feedback from the receiving data controller, as described in 4.5.3 and 5.3.3.	The transmitting data controller selects the packet size and FEC code rate, based on feedback from the receiving data controller.	Refer to data collection form D-13.		
105	5.1.2.2.1(1)	Packets shall be encoded and transmitted in bit order, left to right (see figure 12 [of the MIL-STD]).	Packets are encoded and transmitted in bit order, left to right.	Refer to data collection form D-13.		
106	5.1.2.2.1(2)	The data field shall come first, with the LSB of byte 1 first and continuing in byte order.	The data field comes first, with the LSB of byte 1 first and continuing in byte order.	Refer to data collection form D-13.		

Legend:
ARQ - Automatic Repeat Request
BC - Broadcast Message
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
LSB - Least Significant Bit
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point

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C-14 SUBTEST 14. MODE AND BURST TYPE VERIFICATION

C-14.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for mode and burst type.

C-14.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 16 and 21.

C-14.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-14.1.

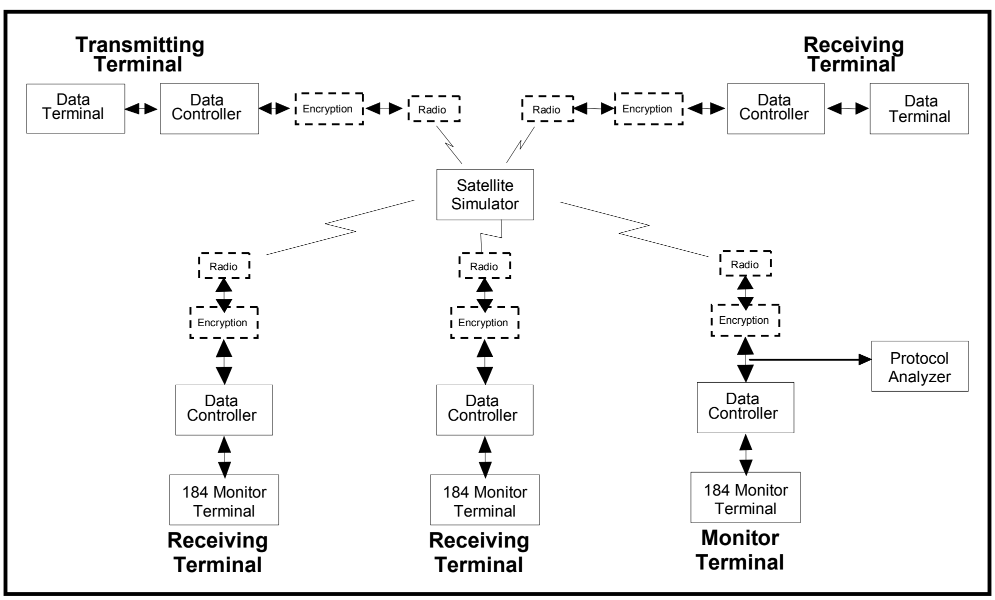

Figure C-14.1. Mode and Burst Type Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-14.1.

Table C-14.1. Mode and Burst Type Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-14.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Mode_Burst_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Mode_Burst _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-14.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-14.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Mode_Burst _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Mode_Burst _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-14.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-14.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Mode_Burst _5K.txt	

Table C-14.1. Mode and Burst Type Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Mode_Burst _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-14.3 for an example of a properly transmitted MC message.	Record results on data collection form D-14.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Mode_Burst _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Mode_Burst _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-14.3 for an example of a properly transmitted MC message.	Record results on data collection form D-14.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Mode_Burst _5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_Packet_Structure_5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-14.4 for an example of a properly transmitted BC message.	Record results on data collection form D-14.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Mode_Burst _100K.txt	
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Mode_Burst _100K.txt	

Table C-14.1. Mode and Burst Type Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-14.4 for an example of a properly transmitted BC message.	Record results on data collection form D-14.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-14.2. PTP Mode and Burst Type Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-14.3. MC Mode and Burst Type Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-14.4. BC Mode and Burst Type Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
BC - Broadcast Message
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
SOM - Start-of-Message

C-14.4 Presentation of Results. The results will be shown in a table similar to table C-14.5 indicating the requirement and measured value or indications of capability.

Table C-14.5. Mode and Burst Type Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
16	4.4.1	The communications modes described in 4.4.1.1 through 4.4.1.3 shall be supported.	Listed in MIL-STD-188-184 4.4.1.1 through 4.4.1.3	Refer to data collection form D-14.		
21	4.4.2	The following burst types shall be used to support connectivity of the three communications modes:	Transmitted packets are the same length and FEC in the burst.	Refer to data collection form D-14.		

Legend:
MIL-STD - Military Standard
FEC - Forward Error Correction

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C-15 SUBTEST 15. BURST AND MESSAGE IDENTIFIER VERIFICATION

C-15.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for burst and message identifiers (ID).

C-15.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 269-280, 321, and 322.

C-15.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-15.1.

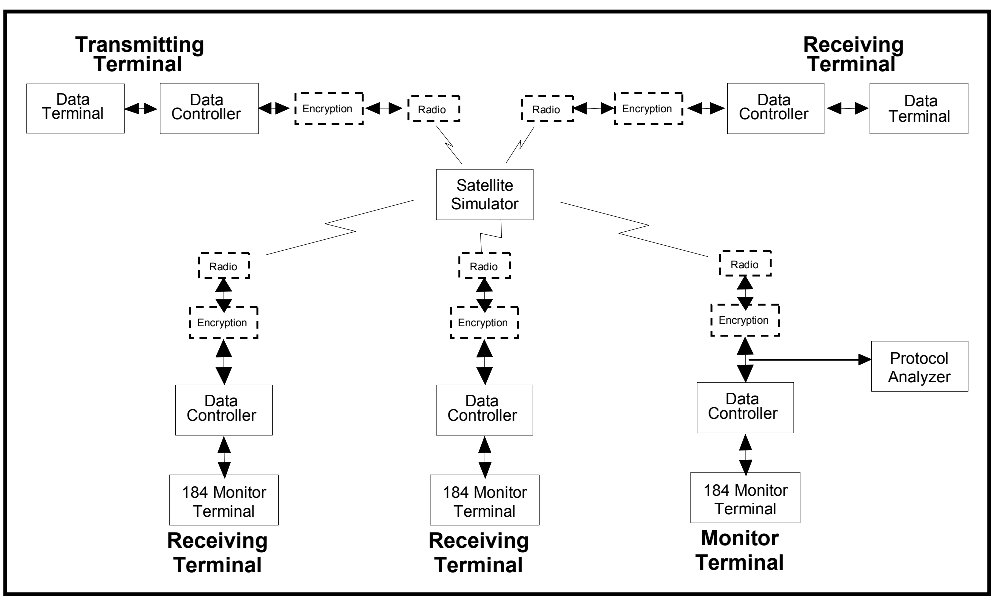

Figure C-15.1. Burst and Message Identifier Network Configuration

c. Test Conduct. The test procedures are listed in table C-15.1.

Table C-15.1. Burst and Message Identifier Test Procedures

Step	Action	Settings/Action	Result

Table C-15.1. Burst and Message Identifier Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Burst_Message_ID _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-15.3 for an example of a properly transmitted MC message.	Record results on data collection form D-15.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Burst_Message_ID _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Burst_Message_ID _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-15.3 for an example of a properly transmitted MC message.	Record results on data collection form D-15.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	

Table C-15.1. Burst and Message Identifier Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-15.4 for an example of a properly transmitted BC message.	Record results on data collection form D-15.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-15.2. PTP Burst and Message Identifier Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-15.3. MC Burst and Message Identifier Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PRI - Priority
REQ - Request
REV - Multicast
SOM - Start-of-Message

Table C-15.4. BC Burst and Message Identifier Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

C-15.4 Presentation of Results. The results will be shown in a table similar to table C-15.5 indicating the requirement and measured value or indications of capability.

Table C-15.5. Burst and Message Identifier Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
269	5.3.7(1)	To maintain proper synchronization, burst and message counters shall be used.	The transmitting data controller identifies bursts with counters.	Refer to data collection form D-15.		
270	5.3.7(2)	The Burst ID and Message ID fields provided in the PTP, BC, and MC headers shall be used for this purpose.	The transmitting data controller identifies bursts with counters.	Refer to data collection form D-15.		
271	5.3.7(3)	The Burst ID shall represent a 4-bit burst counter.	Burst ID has a 4-bit burst counter.	Refer to data collection form D-15.		
272	5.3.7(4)	It shall be incremented modulo 16 for every new burst in the message,…	Burst ID is incremented modulo 16 for every new burst in the message.	Refer to data collection form D-15.		
273	5.3.7(5)	…and shall be reset to zero for each new message.	Burst ID is reset to zero for each new message.	Refer to data collection form D-15.		
274	5.3.7(6)	It shall not be incremented for bursts repeated due to lack of acknowledgment.	Burst ID is not incremented for bursts repeated due to lack of acknowledgment.	Refer to data collection form D-15.		

Table C-15.5. Burst and Message Identifier Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
275	5.3.7(7)	The Message ID field shall represent a 4-bit message counter.	Message ID field represents a 4-bit message counter.	Refer to data collection form D-15.		
276	5.3.7(8)	It shall be incremented modulo 16 for each new message,…	Message ID is incremented modulo 16 for each new message	Refer to data collection form D-15.		
277	5.3.7(9)	…and it shall remain the same for every burst of the message.	Message ID remains the same for every burst of the message.	Refer to data collection form D-15.		
278	5.3.7(10)	Each transmitting data controller shall maintain its own independent message counter.	Each transmitting data controller maintains its independent message counter.	Refer to data collection form D-15.		
279	5.3.7(11)	Burst and Message ID fields shall also be provided in the ACK, PA, and RSYNC headers.	Burst and Message ID fields are provided in the ACK, PA, and RSYNC headers.	Refer to data collection form D-15.		
280	5.3.7(12)	These fields shall refer to the burst and message IDs being acknowledged.	ACK refers to the burst and message IDs being acknowledged.	Refer to data collection form D-15.		
321	5.4.1l(1)	Burst ID. This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new burst in the message,…	Burst ID is incremented modulo 16 for every new burst in the message.	Refer to data collection form D-15.		
322	5.4.1l(2)	…and it shall be reset to zero for each new message.	Burst ID is reset to zero for each new message.	Refer to data collection form D-15.		

Legend:
ACK - Acknowledgement Burst
BC - Broadcast Message
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
PA - Probe Acknowledgement
PTP - Point-to-Point
RSYNC - Resynchronization Burst

C-16 SUBTEST 16. TRANSMIT PROCESS VERIFICATION

C-16.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for burst and message identifiers (ID).

C-16.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 73-77, and 121.

C-16.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-16.1.

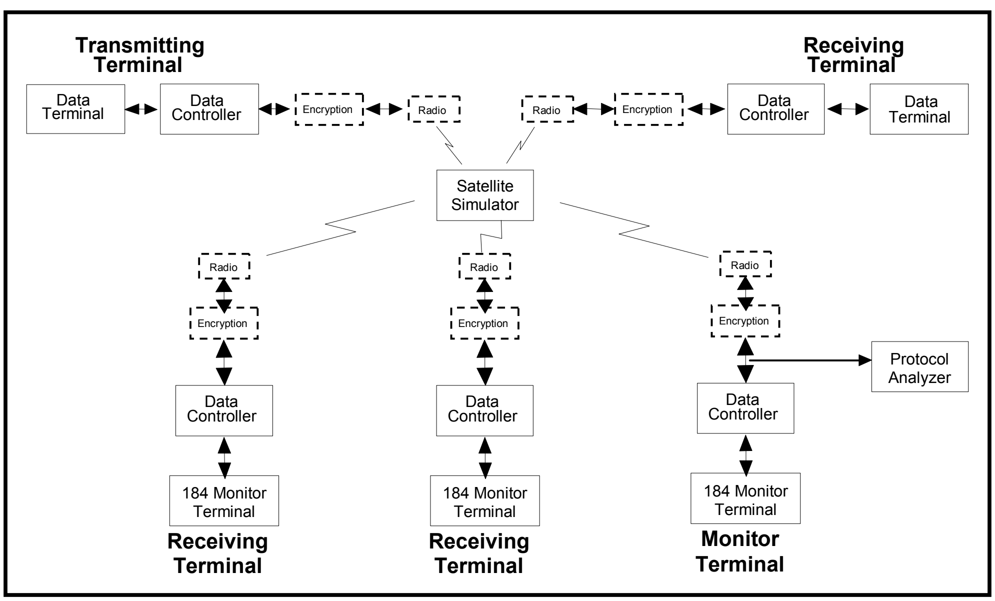

Figure C-16.1. Transmit Process Network Configuration

c. Test Conduct. The test procedures are listed in table C-16.1.

Table C-16.1. Transmit Process Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-16.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Transmit_Process_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Transmit_Process _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-13.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-16.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Transmit_Process _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Transmit_Process _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-16.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-16.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Transmit_Process _5K.txt	

Table C-16.1. Transmit Process Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Transmit_Process _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-16.3 for an example of a properly transmitted MC message.	Record results on data collection form D-16.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Transmit_Process _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Transmit_Process _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-16.3 for an example of a properly transmitted MC message.	Record results on data collection form D-16.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Transmit_Process _5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Transmit_Process _5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-16.4 for an example of a properly transmitted BC message.	Record results on data collection form D-16.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Transmit_Process _100K.txt	
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Transmit_Process _100K.txt	

Table C-16.1. Transmit Process Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-16.4 for an example of a properly transmitted BC message.	Record results on data collection form D-16.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-16.2. PTP Transmit Process Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-16.3. MC Transmit Process Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	

Table C-16.4. BC Transmit Process Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

C-16.4 Presentation of Results. The results will be shown in a table similar to table C-16.5 indicating the requirement and measured value or indications of capability.

Table C-16.5. Transmit Process Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
73	5.1.2(1)	A message received from the data terminal shall be compressed, if compression is enabled, and should be buffered until there is enough data to fill an entire data burst, or the end of the message is reached.				
74	5.1.1(2)	At this point, a header shall be formatted and encoded.				
75	5.1.2(3)	The received data shall be packetized, and, when necessary, cyclic redundancy check (CRC)- and FEC-encoded in preparation for transmission.				
76	5.1.2(4)	The burst transmission shall begin with the start-of-message (SOM), then the header, followed by data packets.	The transmitting data controller sends all required components in the message.	Refer to data collection form D-16.		

Table C-16.5. Transmit Process Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
77	5.1.2(5)	This process shall continue until all data packets have been sent.	The transmitting data controller sends all required components in all bursts of the message.	Refer to data collection form D-16.		
121	5.1.2.3(2)	The code rate shall be determined by the transmitting data controller, based on feedback from the receiving data controller.				
Legend: CRC - Cyclic Redundancy Check		FEC - Forward Error Correction MIL-STD - Military Standard		SOM - Start-of-Message		

C-17 SUBTEST 17. RECEIVE PROCESS VERIFICATION

C-17.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for the receive process.

C-17.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 2 and 155-189.

C-17.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-17.1.

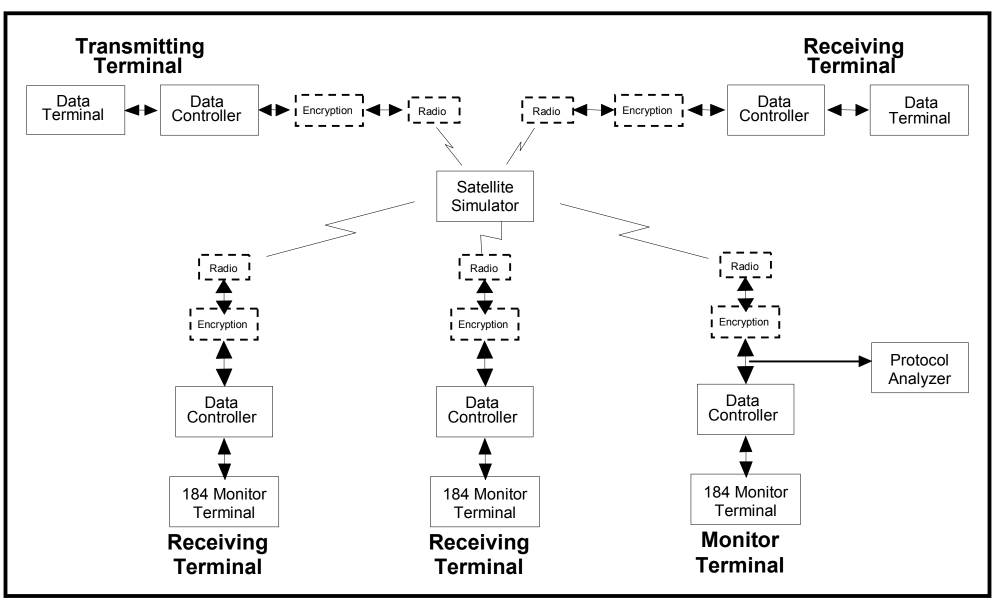

Figure C-17.1. Receive Process Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-17.1.

Table C-17.1. Receive Process Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-17.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Receive_Process_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Receive _Process _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-17.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-17.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Receive _Process _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Receive _Process _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-17.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-17.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Receive _Process _5K.txt	

Table C-17.1. Receive Process Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Receive _Process _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-17.3 for an example of a properly transmitted MC message.	Record results on data collection form D-17.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Receive _Process _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Receive _Process _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-17.3 for an example of a properly transmitted MC message.	Record results on data collection form D-17.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Receive _Process _5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Receive _Process _5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-17.4 for an example of a properly transmitted BC message.	Record results on data collection form D-17.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Receive _Process _100K.txt	
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Receive _Process _100K.txt	

Table C-17.1. Receive Process Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-17.4 for an example of a properly transmitted BC message.	Record results on data collection form D-17.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-17.2. PTP Receive Process Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-17.3. MC Receive Process Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-17.4. BC Receive Process Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

C-17.4 Presentation of Results. The results will be shown in a table similar to table C-17.5 indicating the requirement and measured value or indications of capability.

Table C-17.5. Receive Process Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
155	5.2.1(2)	The data controller shall process the header kernel.	The data controller processes the header kernel.	Refer to data collection form D-17.		
156	5.2.1(3)	If the header type field indicates the presence of a header extension, the data controller shall process the header extension as well.	The data controller shall process the header extension as well.	Refer to data collection form D-17.		
157	5.2.1(4)	If the header CRC is invalid or the header destination field does not match the receiving data controller's network ID, the burst shall be discarded.	The receiving data controller discards messages that do not match its ID the message.	Refer to data collection form D-17.		
158	5.2.1(5)	If the header CRC and the destination field are valid, the burst type field shall be decoded and acted upon.	The burst type field shall be decoded and acted upon.	Refer to data collection form D-17.		
159	5.2.1(6)	If the burst type is a PB or MPB, the receiving data controller shall send a PA, provided the receiving data controller is not busy…	The receiving data controller sends the required ACK.	Refer to data collection form D-17.		

Table C-17.5. Receive Process Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
160	5.2.1(7)	…(if it is busy, it shall respond with an RSYNC burst).	RSYNC is sent if data controller is busy.	Refer to data collection form D-17.		
161	5.2.1(8)	If the burst type is a data burst (PTP, BC, or MC burst), the receiving data controller shall process the data packets that follow the header.	The receiving data controller processes the data packets that follow the header.	Refer to data collection form D-17.		
162	5.2.1(9)	If the PTP, BC, or MC header's No ARQ bit is cleared, the receiving data controller shall formulate and transmit an ACK, as described in 5.4.	ACK is transmitted.	Refer to data collection form D-17.		
163	5.2.1(10)	PA and ACK burst processing shall be as specified in 5.1.1.	PA and ACK burst processing is performed as specified in 5.1.1.	Refer to data collection form D-17.		
164	5.2.2(1)	If a SOM is detected, the receiving data controller shall begin processing the header.	Data controller processes the header.	Refer to data collection form D-17.		
165	5.2.2(2)	Four copies of the kernel and extension (if present) shall be combined and FEC-decoded,…	Four copies of the kernel and extension are combined and FEC-decoded.	Refer to data collection form D-17.		
166	5.2.2(3)	…and the header CRC shall be checked.	CRC is checked.	Refer to data collection form D-17.		
167	5.2.2(4)	If the CRC or the destination ID are invalid, the burst shall be discarded.	Receiving data controller discards invalid IDs.	Refer to data collection form D-17.		
168	5.2.2(5)	Otherwise, the header information shall be interpreted to determine the content of the burst.	Header information is interpreted to determine the content of the burst.	Refer to data collection form D-17.		

Table C-17.5. Receive Process Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
169	5.2.2(6)	When ARQ is disabled, encoded data packets shall be assembled and, for code rates other than 1, FEC-decoded.	Data packets are FEC-decoded.	Refer to data collection form D-17.		
170	5.2.2(7)	The decoded packets shall then be decompressed, if necessary, to retrieve the transmitted message.	Packets are decompressed to retrieve the transmitted message.	Refer to data collection form D-17.		
171	5.2.2(8)	If the format of the current burst is different than the previous burst, encoded packets shall be FEC-decoded, and previously received packets, if any, should be discarded.	Encoded packets are FEC-decoded and previously received packets are discarded.	Refer to data collection form D-17.		
172	5.2.2(9)	A CRC shall also be performed on the decoded packets when ARQ is enabled.	A CRC is performed on the decoded packets when ARQ is enabled.	Refer to data collection form D-17.		
173	5.2.2(10)	Correctly received packets shall then be decompressed, if necessary, to retrieve the transmitted information.	Correctly received packets are decompressed.	Refer to data collection form D-17.		
174	5.2.2(11)	Once a burst has been processed, an ACK shall be sent, as described in 5.3.1.	An ACK is sent.	Refer to data collection form D-17.		
175	5.2.2(12)	The ACK shall identify any packets in error, as described in 4.5.1, and the desired code rate as determined by the receiving data controller.	The ACK includes packet error and code rate information.	Refer to data collection form D-17.		

Table C-17.5. Receive Process Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
176	5.2.2(13)	Channel quality shall be determined and mapped to one of the four possible code rates: 1/2, 3/4, 7/8, or 1.	Channel quality is mapped correctly.	Refer to data collection form D-17.		
177	5.2.2(14)	The desired code rate shall then be sent to the transmitting data controller, using the Requested Code Rate field of the ACK header.	The desired code rate is sent to the transmitting data controller, using the Requested Code Rate field of the ACK header.	Refer to data collection form D-17.		
179	5.2.2.2(1)	The burst type field of the decoded kernel shall indicate the existence of a header extension.	The burst type field of the decoded kernel indicates the existence of a header extension.	Refer to data collection form D-17.		
180	5.2.2.2(2)	If so, the extension repeats shall be combined and FEC-decoded.	The extension repeats are combined and FEC-decoded.	Refer to data collection form D-17.		
181	5.2.2.2(3)	The header CRC shall then be checked against the kernel and extension to determine the validity of the burst.	The header CRC is checked against the kernel and extension to determine the validity of the burst.	Refer to data collection form D-17.		

Table C-17.5. Receive Process Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
183	5.2.2.3(1)	The packet format, specifically the packet size, ARQ, and code rate specified in the header, shall be used to reconstruct the encoded packets from the incoming bit stream.	The incoming encoded packets are reconstructed properly.	Refer to data collection form D-17.		
184	5.2.2.3(2)	The resulting encoded packet size shall be as described in 5.1.2.3.3.	Packet size is as described in 5.1.2.3.3.	Refer to data collection form D-17.		
185	5.2.2.3(3)	If ARQ is disabled, for code rates other than 1, received packets shall be FEC-decoded, as specified in 5.2.2.4.	Packets are FEC-decoded, as specified in 5.2.2.4.	Refer to data collection form D-17.		
186	5.2.2.3(4)	The decoded packets shall then be depacketized.	The decoded packets are depacketized.	Refer to data collection form D-17.		
187	5.2.2.3(5)	For a code rate of 1, or upon completion of FEC decoding, the receiving data controller shall then perform a CRC verification of the packets.	The receiving data controller performs a CRC verification of the packets.	Refer to data collection form D-17.		
188	5.2.2.3(6)	Packets that pass this check shall then be depacketized.	Packets are depacketized.	Refer to data collection form D-17.		
189	5.2.2.3(7)	Once all of the packets in the data burst are processed, the receiving data controller shall format and transmit an ACK burst.	The receiving data controller formats and transmits an ACK burst.	Refer to data collection form D-17.		
2	4.2(2)	Data controllers shall process and respond to all bursts that contain their network ID.	Data controllers process and respond to all			

Table C-17.5. Receive Process Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
160	5.2.1(7)	…(if it is busy, it shall respond with an RSYNC burst).	RSYNC burst is transmitted when busy.	Refer to data collection form D-17.		

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
RSYNC - Resynchronization Burst
SOM - Start-of-Message

C-18 SUBTEST 18. FLOW CONTROL VERIFICATION

C-18.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for the receive process.

C-18.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 58 and 265-268.

C-18.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-18.1.

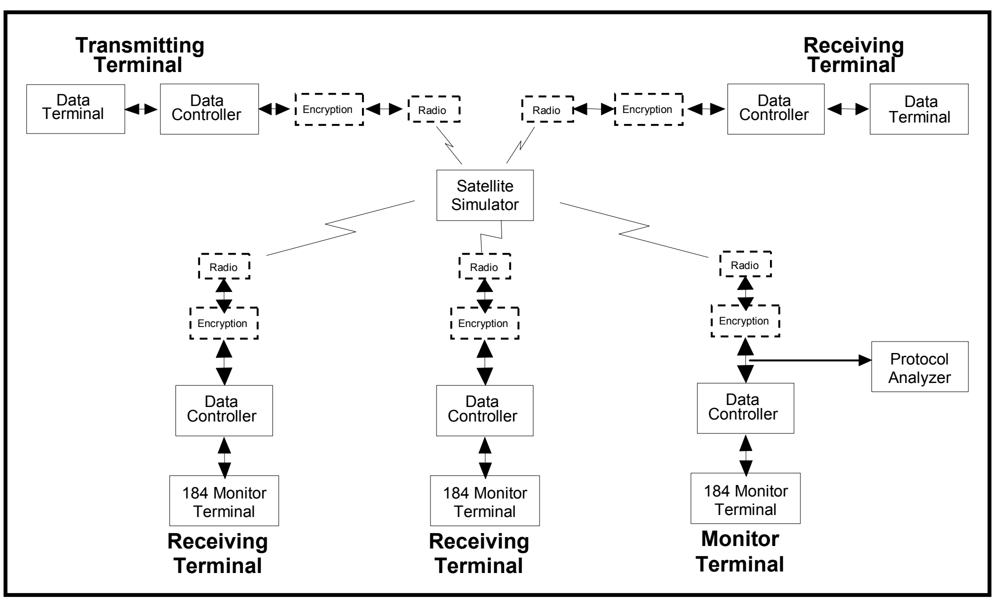

Figure C-18.1. Flow Control Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-18.1.

Table C-18.1. Flow Control Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-18.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Flow_Control_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Flow_Control _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-18.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-18.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Flow_Control _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Flow_Control _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-18.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-18.
13	Reconfigure UUT to send anMC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Flow_Control _5K.txt	

Table C-18.1. Flow Control Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Flow_Control _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-18.3 for an example of a properly transmitted MC message.	Record results on data collection form D-18.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Flow_Control _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Flow_Control _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-18.3 for an example of a properly transmitted MC message.	Record results on data collection form D-18.
24	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
25	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
26	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
27	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
28	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Flow_Control _5K.txt	
29	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Flow_Control _5K.txt	
30	Verify that the BC bursts are received.	Refer to table C-18.4 for an example of a properly transmitted BC message.	Record results on data collection form D-18.
31	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
32	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Flow_Control _100K.txt	
33	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Flow_Control _100K.txt	

Table C-18.1. Flow Control Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-18.4 for an example of a properly transmitted BC message.	Record results on data collection form D-18.

Legend:	ID - Identifier	PTP - Point-to-Point
ACK - Acknowledgment Burst	Kbyte - Kilobyte	txt - Text file extension
ARQ - Automatic Repeat Request	MPB - Multicast Probe Burst	UUT - Unit Under Test
BC - Broadcast Message	PA - Probe Acknowledgement	
FEC - Forward Error Correction	PB - Probe Burst	

Table C-18.2. PTP Flow Control Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:	ID - Identifier	PTP- Point-to-Point
ACK - Acknowledgement Burst	MC - Multicast	REQ - Request
ARQ - Automatic Repeat Request	Mesg - Message	REV - Revision
BER - Bit Error Ratio	PA - Probe Acknowledgement	SOM - Start-of-Message
EOM - End-of-Message	PB - Probe Burst	
FEC - Forward Error Correction	PRI - Priority	

Table C-18.3. MC Flow Control Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	PA - Probe Acknowledgement
ACK - Acknowledgement Burst	ID - Identifier	PRI - Priority
ARQ - Automatic Repeat Request	MC - Multicast	REQ - Request
BER - Bit Error Ratio	Mesg - Message	REV - Revision
EOM - End-of-Message	MPB - Multicast Probe Burst	SOM - Start-of-Message

Table C-18.4. MC Flow Control Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
BC - Broadcast Message
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
SOM - Start-of-Message

C-18.4 Presentation of Results. The results will be shown in a table similar to table C-18.5 indicating the requirement and measured value or indications of capability.

Table C-18.5. Flow Control Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
58	4.5.6	Flow control shall be supported through the Number of Requested Packets field in the ACK header, as described in 5.4.2.	The receiving data controller requests the number of packets to be sent in the ACK	Refer to data collection form D-18.		
265	5.3.6(1)	The ACK shall contain the Number of Requested Packets field for this purpose.	The receiving data controller requests the number of packets to be sent in the ACK	Refer to data collection form D-18.		
266	5.3.6(2)	This 3-bit field shall indicate the number of new packets requested by the receiving data controller.	The 3-bit field indicates the number of new packets requested by the receiving data controller.	Refer to data collection form D-18.		
267	5.3.6(3)	The value in this field shall be interpreted according to paragraph 5.4.2, table XVIII [of the MIL-STD].	The value in this field is interpreted according to paragraph 5.4.2, table XVIII [of the MIL-STD].	Refer to data collection form D-18.		
268	5.3.6(4)	For MC bursts, the number of packets per burst shall be determined by the destination requesting the fewest number of packets.	The number of packets per burst is determined by the destination requesting the fewest number of packets.	Refer to data collection form D-18.		

Legend:
ACK - Acknowledgement Burst
MC - Multicast
MIL-STD - Military Standard

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C-19 SUBTEST 19. PROBE BURST HEADER VERIFICATION

C-19.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for probe burst header verification.

C-19.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 393-409.

C-19.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-19.1.

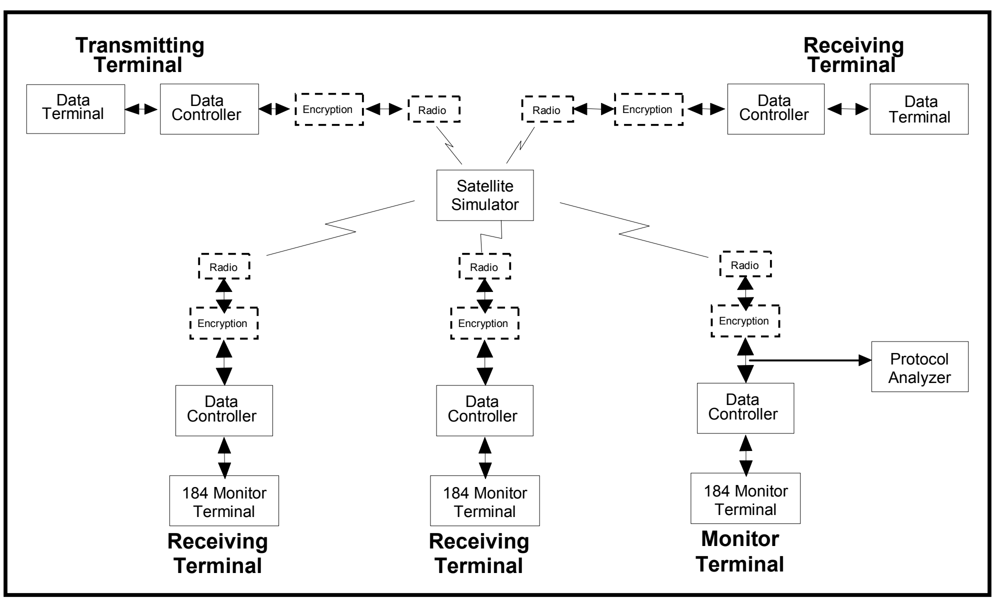

Figure C-19.1. Probe Burst Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-19.1.

Table C-19.1. Probe Burst Header Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-19.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Probe_Burst_Header_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Probe_Burst_Header _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-19.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-19.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Probe_Burst_Header _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Probe_Burst_Header _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-19.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-19.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-19.2. PTP Probe Burst Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF

Table C-19.2. PTP Probe Burst Header Example (continued)

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

C-19.4 Presentation of Results. The results will be shown in a table similar to table C-19.3 indicating the requirement and measured value or indications of capability.

Table C-19.3. Probe Burst Header Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
393	5.4.4(1)	The PB shall be used to capture a channel prior to sending PTP bursts.	The transmitting data controller captures the channel prior to the PTP burst.	Refer to data collection form D-19.		
394	5.4.4(2)	PBs also shall be used by data controllers to exchange revision-level information.	The transmitting data controller sends the revision level.	Refer to data collection form D-19.		
395	Note for table XX [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	Bits are treated as "don't care" bits by the receiving data controller.	Refer to data collection form D-19.		
396	5.4.4a	Burst Type. This 4-bit field shall identify the burst type as Probe, according to table XIII [of the MIL-STD].	Burst type is identified as a Probe.	Refer to data collection form D-19.		
397	5.4.4b	No ARQ. This bit shall be set when message acknowledgment is not enabled.	No ARQ bit is set when message acknowledgment is not enabled.	Refer to data collection form D-19.		

Table C-19.3. Probe Burst Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
398	5.4.4c	Priority. This byte shall be reserved for future use.	Not testable.			
399	5.4.4d(1)	Revision Level. This 8-bit field shall be used to specify the waveform revision level.	Revision Level field identifies the waveform revision level.	Refer to data collection form D-19.		
400	5.4.4d(2)	This field shall be 0 for data controllers built to this revision of the MIL-STD.	Field is set to zero.	Refer to data collection form D-19.		
401	5.4.4e(1)	Destination. This 8-bit field shall contain the network ID of the burst destination.	Destination field contains the network ID of the burst destination.	Refer to data collection form D-19.		
402	5.4.4e(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-19.		
403	5.4.4f(1)	Source. This 8-bit field shall contain the network ID of the burst source.	Source field contains the network ID of the burst source.	Refer to data collection form D-19.		
404	5.4.4f(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-19.		
405	5.4.4g	Burst ID. This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new probe.	Burst ID field is incremented modulo 16 for every new probe.	Refer to data collection form D-19.		
406	5.4.4h	Message ID. This 4-bit field is not used. This field shall be set to all zeros and is reserved for future use.	Message ID field set to all zeros.	Refer to data collection form D-19.		
407	5.4.4i(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC field consists of 3 bytes: CRC lo, CRC mid, and CRC hi.	Refer to data collection form D-19.		

Table C-19.3. Probe Burst Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
408	5.4.4i(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	The 24-bit field is the header CRC: LSB first, MSB last.	Refer to data collection form D-19.		
409	5.4.4j	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros.	Refer to data collection form D-19.		

Legend:
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
ID - Identifier
LSB - Least Significant Bit
MIL-STD - Military Standard
MSB - Most Significant Bit
PB - Probe Burst
PTP - Point-to-Point

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C-20 SUBTEST 20. PROBE ACKNOWLEDGEMENT VERIFICATION

C-20.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for the probe acknowledgement (PA).

C-20.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 53, 54, 64, and 410-424.

C-20.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-20.1.

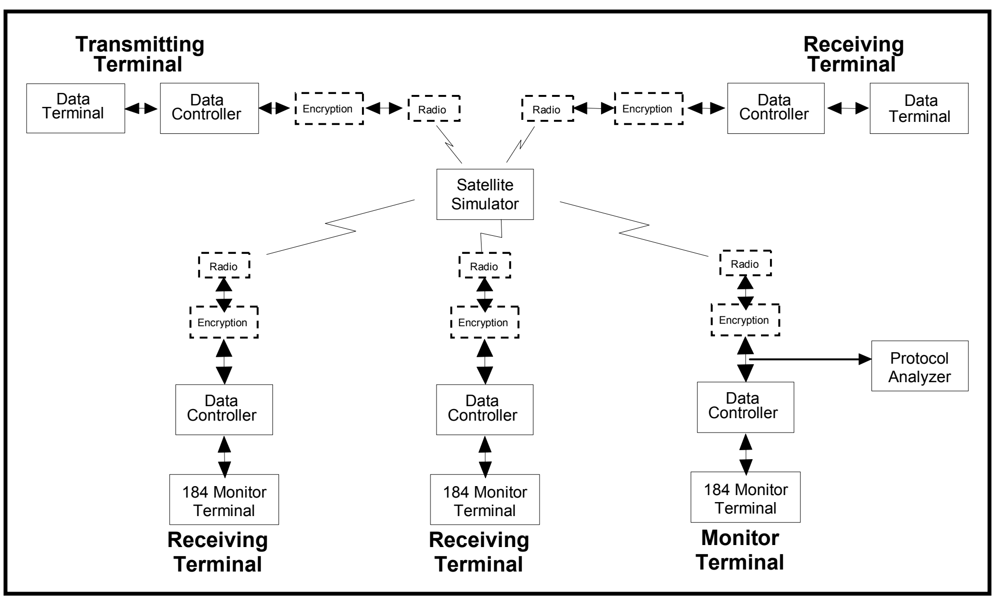

Figure C-20.1. Probe Acknowledgement Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-20.1.

Table C-20.1. Probe Acknowledgement Header Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-20.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Probe_ACK_Header_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Probe_ACK_Header _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-20.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-20.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-20.2. Probe Acknowledgement Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF

Table C-20.2. Probe Acknowledgement Header Example (continued)

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256
Legend: ACK - Acknowledgement Burst ARQ - Automatic Repeat Request BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier MC - Multicast			Mesg - Mesg REQ - Request SOM - Start-of-Message

C-20.4 Presentation of Results. The results will be shown in a table similar to table C-20.3 indicating the requirement and measured value or indications of capability.

Table C-20.3. Probe Acknowledgement Header Test Results

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
53	4.5.2.2(5)	Receiving data controllers shall respond to a PB or MPB with a PA.	Receiving data controller responds with a PA to PB.	Refer to data collection form D-20.		
54	4.5.2.2(6)	When a PA is not received, the transmitting data controller shall wait a random backoff period before retrying.	The transmitting data controller waits a random backoff period before retrying.	Refer to data collection form D-20.		
64	5.1.1(4)	If a PA is not received, the data controller shall again use the backoff algorithm to determine when to transmit another PB or MPB.	The data controller uses the backoff algorithm to determine when to transmit another PB or MPB.	Refer to data collection form D-20.		
410	5.4.5	The PA shall be used to respond to a PB or an MPB.	Receiving data controller responds with a PA to PB.	Refer to data collection form D-20.		
410	5.4.5	The PA shall be used to respond to a PB or an MPB.	Receiving data controller responds with a PA to PB.	Refer to data collection form D-20.		

Table C-20.3. Probe Acknowledgement Header Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
411	Note for table XXI [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	Fields are set to zero.	Refer to data collection form D-20.		
412	5.4.5a	Burst Type. This 4-bit field shall identify the burst type as Probe-Acknowledgment, according to table XIII [of the MIL-STD].	Burst Type field is according to table XIII [of the MIL-STD].	Refer to data collection form D-20.		
413	5.4.5b	Requested Code Rate. This 4-bitfield shall specify the desired code rate of the receiving data controller, as given in table XVII [of the MIL-STD.	Requested Code Rate specifies the desired code rate of the receiving data controller, as given in table XVII [of the MIL-STD.	Refer to data collection form D-20.		
414	5.4.5c	Revision Level. This field shall be 0 for data controllers built to this revision of the MIL-STD.	Revision Level is set to zero by transmitting data controller.	Refer to data collection form D-20.		
415	5.4.5d(1)	Destination. This 8-bit field shall contain the network ID of the burst destination.	Destination field contains the network ID of the burst destination.	Refer to data collection form D-20.		
416	5.4.5d(2)	Values from 1 to 64 shall be valid.	Data controller accepts IDs from 1 to 64.	Refer to data collection form D-20.		
417	5.4.5e(1)	Source. This 8-bit field shall contain the network ID of the burst source.	Source field contains the network ID of the burst source.	Refer to data collection form D-20.		
418	5.4.5e(2)	Values from 1 to 64 shall be valid.	Data controller accepts IDs from 1 to 64.	Refer to data collection form D-20.		

Table C-20.3. Probe Acknowledgement Header Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
419	5.4.5f	Burst ID. This 4-bit field represents the burst count. It shall be set to the burst ID of the PB being acknowledged.	Burst ID is set to the burst ID of the PB being acknowledged.	Refer to data collection form D-20.		
420	5.4.5g(1)	Message ID. This 4-bit field is not used. This field shall be set to all zeros…	Message ID is set to zero.	Refer to data collection form D-20.		
421	5.4.5g(2)	…and shall be reserved for future use.	Not Testable.			
422	5.4.5h(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC consists of three bytes.	Refer to data collection form D-20.		
423	5.4.5h(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	24-bit field is the header CRC: LSB first, MSB last.	Refer to data collection form D-20.		

Legend:
CRC - Cyclic Redundancy Check
ID - Identifier
LSB - Least Significant Bit
MIL-STD - Military Standard
MPB - Multicast Probe Burst
MSB - Most Significant Bit
PA - Probe Acknowledgment
PB - Probe Burst

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C-21 SUBTEST 21. MULTICAST PROBE HEADER VERIFICATION

C-21.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for multicast probe headers.

C-21.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 2 and 155-189.

C-21.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-21.1.

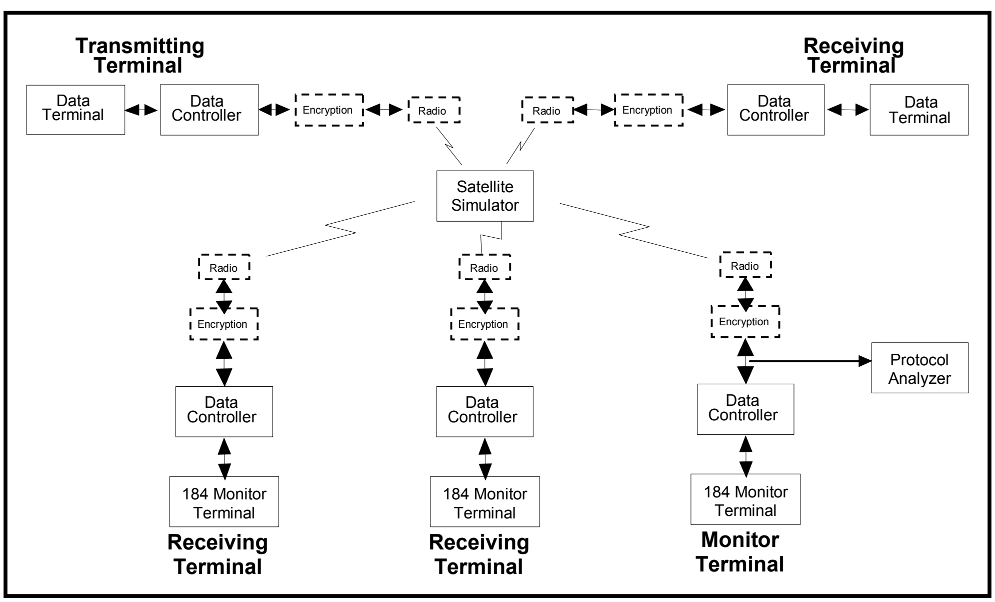

Figure C-21.1. Multicast Probe Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-21.1.

Table C-21.1. Multicast Probe Header Test Procedures

Step	Action	Settings/Action	Result
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_Probe_Header _5K.txt	
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_Probe_Header _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-21.3 for an example of a properly transmitted MC message.	Record results on data collection form D-21.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_Probe_Header _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_Probe_Header _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-21.3 for an example of a properly transmitted MC message.	Record results on data collection form D-21.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-21.2. Multicast Probe Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF

Table C-21.2. Multicast Probe Header Example (continued)

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

C-21.4 Presentation of Results. The results will be shown in a table similar to table C-21.3 indicating the requirement and measured value or indications of capability.

Table C-21.3. Multicast Probe Header Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
425	5.4.6(1)	The MPB shall be used to capture a channel prior to sending an MC burst.	Receiving data controller responds with a PA to MPB.	Refer to data collection form D-21.		
426	5.4.6(2)	If after consecutive retransmissions, greater than the Maximum Number of Retries, acknowledgment is still not received, the transmitting data controller shall abort the message and should notify the operator.	Receiving data controller responds with a PA to MPB.	Refer to data collection form D-21.		
427	5.4.6a.1	Burst Type. This 4-bit field shall identify the burst type as MPB, according to table XIII [of the MIL-STD].	Burst type field identifies the burst type as MPB, according to table XIII [of the MIL-STD].	Refer to data collection form D-21.		
428	Note for table XXII [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	Fields are set to zero by the transmitting data controller	Refer to data collection form D-21.		
429	5.4.6a.2	No ARQ. This bit shall be set when message acknowledgment is not enabled.	This bit is set when message acknowledgment is not enabled.	Refer to data collection form D-21.		

Table C-21.3. Multicast Probe Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
430	5.4.6a.3	Priority. This byte shall be reserved for future use.	Not testable.			
431	5.4.6a.4(1)	Revision Level. This 8-bit field shall be used to specify the waveform revision level.	Revision level is identified.	Refer to data collection form D-21.		
432	5.4.6a.4(2)	This field shall be 0 for data controllers built to this revision of the MIL-STD.	Field is set to zero.	Refer to data collection form D-21.		
433	5.4.6a.5(1)	Source. This 8-bit field shall contain the network ID of the burst source.	Field contains the network ID of the burst source.	Refer to data collection form D-21.		
434	5.4.6a.5(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are valid and those outside of this range are rejected.	Refer to data collection form D-21.		
435	5.4.6a.6	Burst ID. This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new probe.	Burst ID is incremented modulo 16 for every new probe.	Refer to data collection form D-21.		
436	5.4.6a.7(1)	Message ID. This 4-bit field is not used. This field shall be set to all zeros…	Message ID field is set to zero.	Refer to data collection form D-21.		
437	5.4.6a.7(2)	…and shall be reserved for future use.	Not testable.			
438	5.4.6a.8(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC field consists of 3 bytes: CRC lo, CRC mid, and CRC hi.	Refer to data collection form D-21.		
439	5.4.6a.8(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	Field is the header CRC: LSB first, MSB last.	Refer to data collection form D-21.		
440	5.4.6a.8(3)	The CRC shall be applied to the header kernel and extension.	The CRC is applied to the header kernel and extension.	Refer to data collection form D-21.		

Table C-21.3. Multicast Probe Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
441	5.4.6a.9	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	8-bit field is filled with zeros	Refer to data collection form D-21.		
442	5.4.6b.1(1)	Destinations. This 64-bit field shall specify the message's multiple destination network ID.	64-bit field specifies the message's multiple destination network ID.	Refer to data collection form D-21.		
443	5.4.6b.1(3)	Each bit in this bitmapped field shall represent the network ID of a destination (the first bit = ID #1, the second bit = ID #2, and so on).	Each bit in this field represents the network ID of a destination.	Refer to data collection form D-21.		
444	5.4.6b.1(3)	No more than 10 bits shall be set for an MC message.	No more than 10 bits are set for an MC message.	Refer to data collection form D-21.		
445	5.4.6b.2	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros.	Refer to data collection form D-21.		

Legend:
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
ID - Identifier
LSB - Least Significant Bit
MIL-STD - Military Standard
MC - Multicast
MSB - Most Significant Bit
MPB - Multicast Probe Burst
PA -Probe Acknowledgement

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C-22 SUBTEST 22. POINT-TO-POINT AND BROADCAST HEADER VERIFICATION

C-22.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for point-to-point and broadcast headers.

C-22.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 304-320 and 323-328.

C-22.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-22.1.

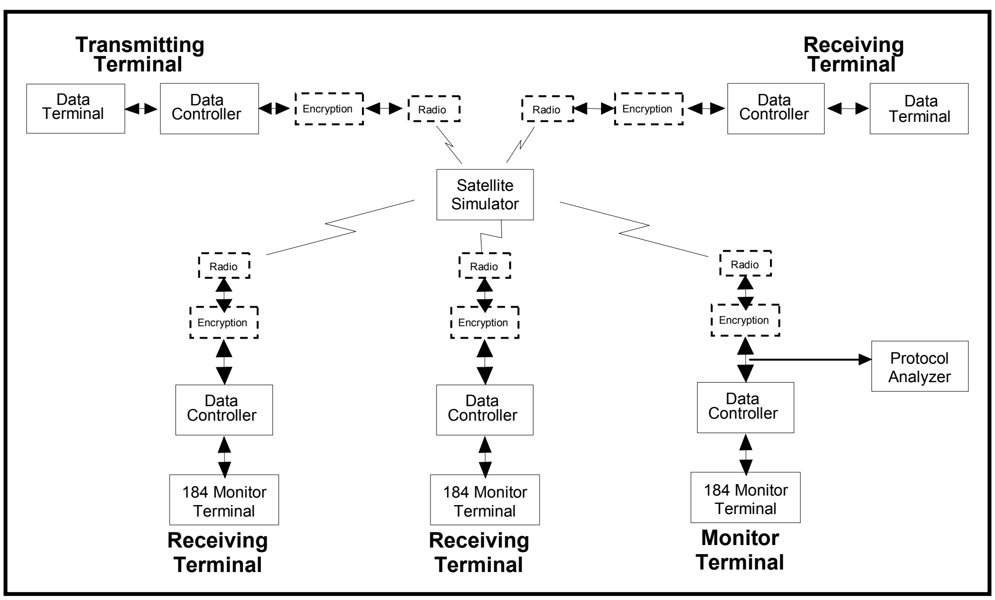

Figure C-22.1. Point-to-Point and Broadcast Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-22.1.

Table C-22.1. Point-to-Point and Broadcast Header Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-22.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Header_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Header _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-18.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-22.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Header _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Header _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-22.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-22.
13	Reconfigure UUT to send a BC message.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send a BC message with a 5-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Header _5K.txt	

Table C-22.1. Point-to-Point and Broadcast Header Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Header _5K.txt	
19	Verify that the BC bursts are received.	Refer to table C-22.3 for an example of a properly transmitted BC message.	Record results on data collection form D-22.
20	Send a BC message with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\BC_ Header _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\BC_ Header _100K.txt	
23	Verify that the BC bursts are received.	Refer to table C-22.3 for an example of a properly transmitted BC message.	Record results on data collection form D-22.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-22.2. PTP Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-22.3. BC Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM

Legend:
BC - Broadcast Message
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
Mesg - Message
SOM - Start-of-Message

C-22.4 Presentation of Results. The results will be shown in a table similar to table C-22.4 indicating the requirement and measured value or indications of capability.

Table C-22.4. Point-to-Point and Broadcast Header Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
18	4.4.1.2	Broadcast messages are destined to all members of the network and shall not be acknowledged.	Broadcast messages are not acknowledged.	Refer to data collection form D-22.		
304	5.4.1(1)	A PTP header shall be used to send message data to a single destination, with or without an acknowledgment.	Acknowledgement is received when ACK is requested and not received when not requested.	Refer to data collection form D-22.		
305	5.4.1(2)	A BC header shall be used to send message data to all network destinations, without an acknowledgment.	BC header sends message data to all network destinations, without an acknowledgment.	Refer to data collection form D-22.		
306	5.4.1a	Burst Type. This 4-bit field shall identify the burst type as PTP and BC, according to table XIII [of the MIL-STD].	Burst type field identifies the burst type as PTP and BC, according to table XIII [of the MIL-STD].	Refer to data collection form D-22.		
307	5.4.1b	No ARQ. This bit shall be set when message acknowledgment is not enabled.	ARQ bit shall be set when message acknowledgment is not enabled.	Refer to data collection form D-22.		

Table C-22.4. Point-to-Point and Broadcast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
308	5.4.1c	Compression. This bit shall be set only if message data has been compressed.	Compression bit is set only if message data has been compressed.	Refer to data collection form D-22.		
309	Note for table XII [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	Fields are set to zero by the transmitting data controller.	Refer to data collection form D-22.		
310	5.4.1d	Start-of-Message. This bit shall be set for the first burst of a message and cleared for all subsequent bursts of the message.	SOM bit is set for the first burst of a message and cleared for all subsequent bursts of the message.	Refer to data collection form D-22.		
311	5.4.1e	End-of-Message. This bit shall be cleared for all bursts except the last burst of a message.	EOM bit is cleared for all bursts except the last burst of a message.	Refer to data collection form D-22.		
312	5.4.1f	Code Rate. This 3-bit field shall specify the FEC code rate used, according to table XIV [of the MIL-STD].	Code rate field specifies the FEC code rate used, according to table XIV [of the MIL-STD].	Refer to data collection form D-22.		
313	5.4.1g	Packet Size. This 3-bit field shall specify the number of data bits in a data packet, according to table XV [of the MIL-STD].	Packet size field specifies the number of data bits in a data packet, according to table XV [of the MIL-STD].	Refer to data collection form D-22.		
314	5.4.1h	De-Stuff. This bit shall be set in the last burst of the message if the last packet is stuffed.	De-stuff bit is set in the last burst of the message if the last packet is stuffed.	Refer to data collection form D-22.		

Table C-22.4. Point-to-Point and Broadcast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
315	5.4.1i	Number of Packets. This 8-bit field shall indicate the number of data packets in the burst, less 1.	Number of packets field indicates the number of data packets in the burst, less 1.	Refer to data collection form D-22.		
316	5.4.1j(1)	Destination. This 8-bit field shall contain the network ID of the message destination.	Destination field contains the network ID of the message destination.	Refer to data collection form D-22.		
317	5.4.1j(2)	Values from 1 to 64 shall be PTP destinations.	Values from 1 to 64 are accepted PTP destinations.	Refer to data collection form D-22.		
318	5.4.1j(3)	The value 255 shall signify BC.	The value 255 is accepted as a BC message.	Refer to data collection form D-22.		
319	5.4.1k(1)	Source. This 8-bit field shall contain the network ID of the message source.	Source field contains the network ID of the message source.	Refer to data collection form D-22.		
320	5.4.1k(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are valid.	Refer to data collection form D-22.		
323	5.4.1m(1)	Message ID. This 4-bit field represents the message counter. It shall be incremented modulo 16 for each new message,…	Message ID is incremented modulo 16 for each new message.	Refer to data collection form D-22.		
324	5.4.1m(2)	…and it shall remain the same for every burst of the message.	Message ID remains the same for every burst of the message.	Refer to data collection form D-22.		
325	5.4.1m(3)	Each transmitting data controller shall maintain its own independent message counter.	Each transmitting data controller maintains its own independent message counter.	Refer to data collection form D-22.		

Table C-22.4. Point-to-Point and Broadcast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
326	5.4.1n(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC field consists of 3 bytes: CRC lo, CRC mid, and CRC hi.	Refer to data collection form D-22.		
327	5.4.1n(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	The 24-bit field is the header CRC: LSB first, MSB last.	Refer to data collection form D-22.		
328	5.4.1o	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros	Refer to data collection form D-22.		

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BC - Broadcast Message
CRC - Cyclic Redundancy Check
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
LSB - Least Significant Bit
MIL-STD - Military Standard
MSB - Most Significant Bit
PTP - Point-to-Point
SOM - Start-of-Message

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C-23 SUBTEST 23. ACKNOWLEDGEMENT HEADER VERIFICATION

C-23.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for acknowledgement headers.

C-23.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 5, 26, 27, 35, 212, 213, and 329-256.

C-23.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-23.1.

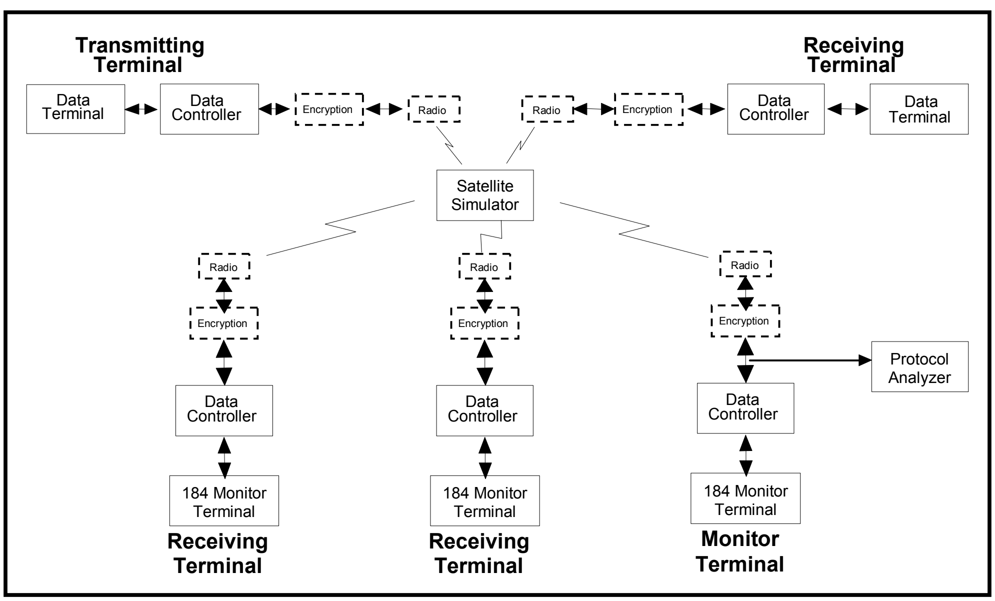

Figure C-23.1. Acknowledgement Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-23.1.

Table C-23.1. Acknowledgement Header Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-23.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Acknowledgement_Header_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_Acknowledgement_Header _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-23.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-23.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ PTP_Acknowledgement_Header _5K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Acknowledgement_Header _5K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-23.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-23.
13	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
14	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_Probe_Header _5K.txt	

Table C-23.1. Acknowledgement Header Test Procedures (continued)

Step	Action	Settings/Action	Result
15	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_Probe_Header _5K.txt	
16	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-23.3 for an example of a properly transmitted MC message.	Record results on data collection form D-23.
17	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
18	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_Probe_Header _100K.txt	
19	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_Probe_Header _100K.txt	
20	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-23.3 for an example of a properly transmitted MC message.	Record results on data collection form D-23.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-23.2. PTP Acknowledgement Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-23.3. MC Acknowledgement Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
REQ - Request
SOM - Start-of-Message

C-23.4 Presentation of Results. The results will be shown in a table similar to table C-23.4 indicating the requirement and measured value or indications of capability.

Table C-23.4. Acknowledgement Header Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
5	4.2.3	With ARQ enabled, receiving data controllers shall provide feedback to the transmitting data controller, using the ARQ protocol defined in 4.5.1 and 5.3.1.	Receiving data controllers provide feedback to the transmitting data controller, using the ARQ protocol defined in 4.5.1 and 5.3.1.	Refer to data collection form D-23.		

Table C-23.4. Acknowledgement Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
26	4.5.1.1(1)	The PTP ACK protocol, illustrated in figure 7 [of the MIL-STD], shall be used to provide error-free delivery to a single destination.	The PTP ACK protocol, illustrated in figure 7 [of the MIL-STD] is used.	Refer to data collection form D-23.		
27	4.5.1.1(2)	After transmission of each data burst, the receiving data controller shall reply with an ACK, indicating receipt of the data burst and which packets, if any, were received in error.	Receiving data controller replies with an ACK.	Refer to data collection form D-23.		
35	4.5.1.2	Acknowledgment slots shall follow the end of the data burst in ascending order, by destination address.	Acknowledgment slots follow the end of the data burst in ascending order, by destination address.	Refer to data collection form D-23.		
212	5.3.1.1(5)	The receiving data controller shall use the CRC to determine if packets were received in error.	The receiving data controller uses the CRC to determine if packets were received in error.	Refer to data collection form D-23.		
213	5.3.1.1(6)	The receiving data controller shall respond to the transmitting data controller with an ACK, as described in 4.5.1.1.	The receiving data controller responds to the transmitting data controller with an ACK.	Refer to data collection form D-23.		
329	5.4.2(1)	An ACK shall be sent in response to a PTP or MC burst.	An ACK is sent in response to a PTP or MC burst.	Refer to data collection form D-23.		
330	5.4.2(2)					

Table C-23.4. Acknowledgement Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
332	5.4.2(4)	…and shall be specified in the header kernel field, Extension ACK Bytes.	and is specified in the header kernel field, Extension ACK Bytes.	Refer to data collection form D-23.		
333	Note for table XVI [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	Fields are set to zero.	Refer to data collection form D-23.		
334	5.4.2a.1	Burst Type. This 4-bit field shall identify the burst type as Acknowledgment, according to table XIII [of the MIL-STD].	Burst type field identifies the burst type as Acknowledgment, according to table XIII [of the MIL-STD].	Refer to data collection form D-23.		
335	5.4.2a.2	Requested Code Rate. This 4-bit field shall specify to the transmitting data controller the desired code rate of the next burst, as given in table XVII [of the MIL-STD].	Requested Code Rate field specifies to the transmitting data controller the desired code rate of the next burst, as given in table XVII [of the MIL-STD].	Refer to data collection form D-23.		
336	5.4.2a.3(1)	Number of Requested Packets. This 3-bit field shall indicate the maximum number of new packets requested by the receiving data controller, in addition to any repeated packets.	Number of Requested Packets field indicates the maximum number of new packets requested by the receiving data controller, in addition to any repeated packets.	Refer to data collection form D-23.		
337	5.4.2a.3(2)	The value in this field shall be interpreted as shown in table XVIII [of the MIL-STD].	The value in field is interpreted as shown in table XVIII [of the MIL-STD].	Refer to data collection form D-23.		

Table C-23.4. Acknowledgement Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
338	5.4.2a.4(1)	Extension ACK bytes. This 5-bit field shall indicate the number of bytes, *n,* in the ACKs field of the header extension.	Extension ACK bytes field indicate the number of bytes, *n,* in the ACKs field of the header extension.	Refer to data collection form D-23.		
339	5.4.2a.4(2)	The extension field shall contain between 1 and 256 individual ACK bits.	The extension field contains between 1 and 256 individual ACK bits.	Refer to data collection form D-23.		
340	5.4.2a.5(1)	Destination. This 8-bit field shall contain the network ID of the burst destination.	Destination field contains the network ID of the burst destination.	Refer to data collection form D-23.		
341	5.4.2a.5(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-23.		
342	5.4.2a.6(1)	Source. This 8-bit field shall contain the network ID of the burst source.	Source field contains the network ID of the burst source.	Refer to data collection form D-23.		
343	5.4.2a.6(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-23.		
344	5.4.2a.7	Burst ID. This 4-bit field represents the burst count. It shall be set to the burst ID of the data burst being acknowledged.	Burst ID field is set to the burst ID of the data burst being acknowledged.	Refer to data collection form D-23.		
345	5.4.2a.8	Message ID. This 4-bit field represents the message count. It shall be set to the message ID of the data burst being acknowledged.	Message ID field is set to the message ID of the data burst being acknowledged.	Refer to data collection form D-23.		
346	5.4.2a.9(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC field consists of 3 bytes: CRC lo, CRC mid, and CRC hi.	Refer to data collection form D-23.		

Table C-23.4. Acknowledgement Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
356	5.4.2b.2	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros.	Refer to data collection form D-23.		
35	4.5.1.2	Acknowledgment slots shall follow the end of the data burst in ascending order, by destination address.	Acknowledgment slots follow the end of the data burst in ascending order, by destination address.	Refer to data collection form D-23.		
212	5.3.1.1(5)	The receiving data controller shall use the CRC to determine if packets were received in error.	The receiving data controller uses the CRC to determine if packets were received in error.	Refer to data collection form D-23.		

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
ID - Identifier
LSB - Least Significant Bit
MC - Multicast
MIL-STD - Military Standard
MSB - Most Significant Bit
PTP - Point-to-Point

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C-24 SUBTEST 24. MULTICAST HEADER VERIFICATION

C-24.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for multicast headers.

C-24.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 357-392.

C-24.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-24.1.

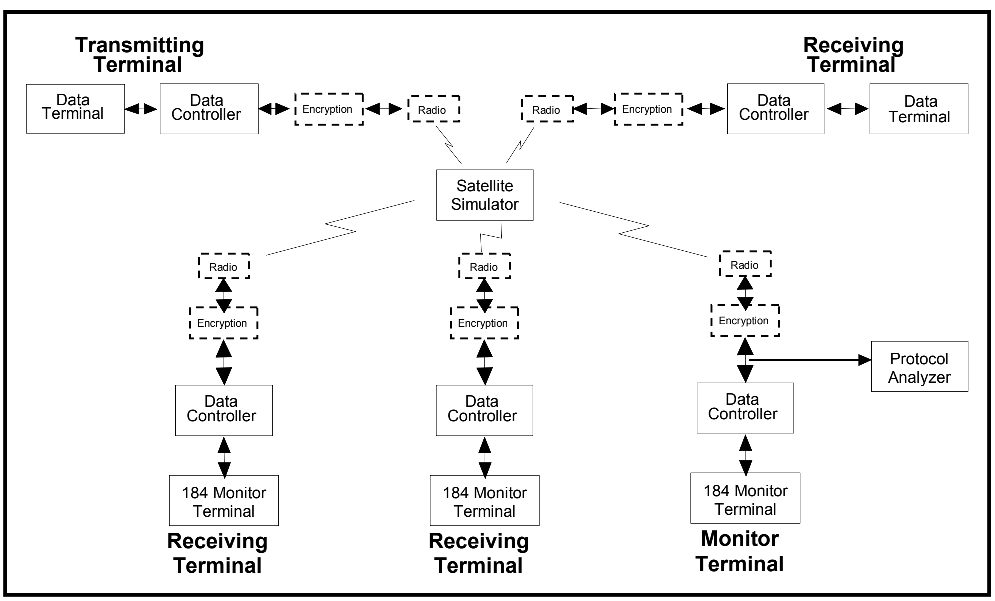

Figure C-24.1. Multicast Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-24.1.

Table C-24.1. Multicast Header Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-24.1.	
2	Configure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_ Header _5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_Header _5K.txt	
8	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-24.2 for an example of a properly transmitted MC message.	Record results on data collection form D-24.
9	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_ Header _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_ Header _100K.txt	
12	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-24.3 for an example of a properly transmitted MC message.	Record results on data collection form D-24.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgemetn
txt - Text file extension
UUT - Unit Under Test

Table C-24.2. Multicast Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
REQ - Request
SOM - Start-of-Message

C-24.4 Presentation of Results. The results will be shown in a table similar to table C-24.3 indicating the requirement and measured value or indications of capability.

Table C-24.3. Multicast Header Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
19	4.4.1.3(1)	Multicast messages shall be addressed to as many as 10 net members.	Multicast messages accept 10 addresses when transmitting to net members.	Refer to data collection form D-24.		

Table C-24.3. Multicast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
41	4.5.1.2.3(1)	The MC header extension shall include a bit-mapped Packet Repeats field that has 1 bit for every packet of the last acknowledged burst.	The MC header extension includes a bit-mapped Packet Repeats field that has 1 bit for every packet of the last acknowledged burst.	Refer to data collection form D-24.		
357	5.4.3(1)	MC bursts shall be used to send message data to multiple destinations (up to 10).	MC headers are attached when UUT is configured to send an MC burst.	Refer to data collection form D-24.		
358	5.4.3(2)	This header shall have an extension that contains 2 bit-mapped fields: the fixed-length Destinations field, and the variable-length Packet Repeats field.	MC headers are attached when UUT is configured to send an MC burst.	Refer to data collection form D-24.		
359	Note for table XIX [of the MIL-STD]	These fields are not allocated; they should be set to zero by the transmitting data controller and shall be treated as "don't care" bits by the receiving data controller.	Fields are set to zero.	Refer to data collection form D-24.		
360	5.4.3a.1	Burst Type. This 4-bit field shall identify the burst type as MC, according to table XIII [of the MIL-STD].	Burst type field identifies the burst type as MC, according to table XIII [of the MIL-STD].	Refer to data collection form D-24.		
361	5.4.3a.2	No ARQ. This bit shall be set when message acknowledgment is not enabled.	No ARQ bit is set when message acknowledgment is not enabled.	Refer to data collection form D-24.		

Table C-24.3. Multicast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding
			Required Value	Measured Value	Met

Table C-24.3. Multicast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
369	5.4.3a.10	Number of Repeats. This 8-bit field shall specify the number of bytes, *n*, in the Packet Repeats field of the header extension.	Number of Repeats field specifies the number of bytes, *n*, in the Packet Repeats field of the header extension.	Refer to data collection form D-24.		
370	5.4.3a.11(1)	Source. This 8-bit field shall contain the network ID of the message source.	Source field contains the network ID of the message source.	Refer to data collection form D-24.		
371	5.4.3a.11(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-24.		
372	5.4.3a.12(1)	Burst ID. This 4-bit field represents the burst count. It shall be incremented modulo 16 for every new burst in the message,…	Burst ID is incremented modulo 16 for every new burst in the message.	Refer to data collection form D-24.		
373	5.4.3a.12(2)	…and it shall be reset to zero for each new message.	Burst ID is reset to zero for each new message.	Refer to data collection form D-24.		
374	5.4.3a.13(1)	Message ID. This 4-bit field represents the message count. It shall be incremented modulo 16 for each new message,…	Message ID is incremented modulo 16 for each new message.	Refer to data collection form D-24.		
375	5.4.3a.13(2)	…and it shall remain the same for every burst of the message.	Message ID is the same for every burst of the message.	Refer to data collection form D-24.		
376	5.4.3a.13(3)	Each transmitting data controller shall maintain its own independent message counter.	Each transmitting data controller maintains its own independent message counter.	Refer to data collection form D-24.		

Table C-24.3. Multicast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
377	5.4.3a.14(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC field consists of 3 bytes: CRC lo, CRC mid, and CRC hi.	Refer to data collection form D-24.		
378	5.4.3a.14(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	CRC field is 24 bits with header CRC: LSB first, MSB last.	Refer to data collection form D-24.		
380	5.4.3a.15	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros	Refer to data collection form D-24.		
381	5.4.3b.1(1)	Destinations. This 64-bit field (8 bytes) specifies the message's multiple-destination network IDs. Each bit in this bit-mapped field shall represent the network ID of a destination (the first bit = ID#1, the second bit = ID #2, and so on).	Destinations field specifies the message's multiple-destination network IDs.	Refer to data collection form D-24.		
382	5.4.3b.1(2)	No more than 10 bits shall be set for an MC message.	No more than 10 bits are set for an MC message.	Refer to data collection form D-24.		
383	5.4.3b.2(1)	Packet Repeats. This variable-length field shall be between 1 and 32 bytes long.	Packet Repeats field is between 1 and 32 bytes long.	Refer to data collection form D-24.		
384	5.4.3b.2(2)	The field shall provide a bit-mapped indication of those packets from the previous burst that are repeated in this burst.	Repeat field provides a bit-mapped indication of those packets from the previous burst that are repeated in this burst.	Refer to data collection form D-24.		

Table C-24.3. Multicast Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
385	5.4.3b.2(3)	The bit map shall contain a bit for each packet in the previous data burst.	The bit map contains a bit for each packet in the previous data burst.	Refer to data collection form D-24.		
386	5.4.3b.2(4)	The first bit shall correspond to the first packet,…	The first bit corresponds to the first packet.	Refer to data collection form D-24.		
387	5.4.3b.2(5)	…and the last bit shall correspond to the last packet.	The last bit corresponds to the last packet.	Refer to data collection form D-24.		
388	5.4.3b.2(6)	A bit shall be set to signify that the packet is repeated in this burst.	A bit is set to signify that the packet is repeated in this burst.	Refer to data collection form D-24.		
389	5.4.3b.2(7)	The bit shall be cleared to signify that the packet is not repeated.	The bit is cleared to signify that the packet is not repeated.	Refer to data collection form D-24.		
390	5.4.3b.2(8)	The length of this field shall be as specified in the Number of Repeats field in the kernel header.	The length the field is as specified in the Number of Repeats field in the kernel header.	Refer to data collection form D-24.		
391	5.4.3b.2(9)	Unused bits in the last byte shall be set to zero.	Unused bits in the last byte are set to zero.	Refer to data collection form D-24.		
392	5.4.3b.3	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros.	Refer to data collection form D-24.		

Legend:
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
FEC - Forward Error Correction
ID - Identifier
LSB - Least Significant Bit
MC - Multicast
MIL-STD - Military Standard
MSB - Most Significant Bit

C-25 SUBTEST 25. RESYNCHRONIZATION HEADER VERIFICATION

C-25.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for resynchronization headers.

C-25.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 59, 60, 215, 281-301, and 446-459.

C-25.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-25.1.

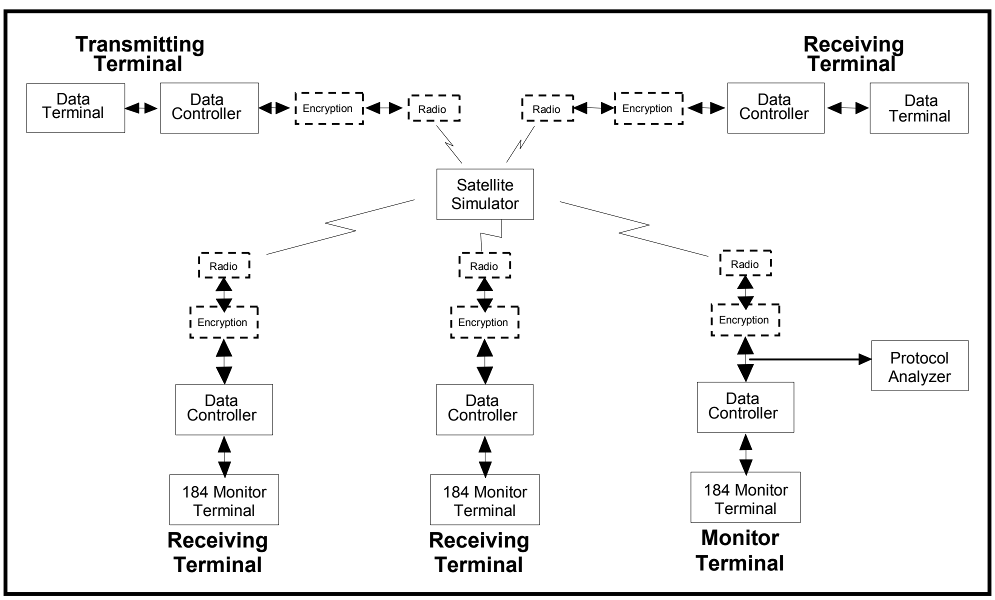

Figure C-25.1. Resynchronization Header Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-25.1.

Table C-25.1. Resynchronization Header Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-25.1.	
2	Configure UUT to send a PTP message with no probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Resynch_Header_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Resynch_Header 5K.txt	
8	Verify that the PB, PA, PTP and ACK bursts are received.	Refer to table C-25.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-25.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-25.2. Resynchronization Header Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
15:00:12	PTP	2	1	1	11	BER 0% FEC 1/2 PACKETS 256 ARQ SOM
15:01:11	ACK	1	2	1	11	BER 0% REPEATS 0 REQ 3/4 FLOW 256
15:01:20	PTP	2	1	2	11	BER 0% FEC 1/2 PACKETS 256 ARQ
15:02:20	ACK	1	2	2	11	BER 0% REPEATS 0 REQ 3/4 FLOW 256
15:02:28	PTP	2	1	3	11	BER 0% FEC 1/2 PACKETS 256 ARQ
15:03:28	ACK	1	2	3	11	BER 0% REPEATS 0 REQ 3/4 FLOW 256
15:03:37	PTP	2	1	4	11	BER 0% FEC 1/2 PACKETS 256 ARQ
15:04:36	RSYNC	2	1	4	11	BER 0% REV 1 WHY Unexpected Burst ID

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
REQ - Request
REV - Revision
RSYNC - Resynchronization Burst
SOM - Start-of-Message

C-25.4 Presentation of Results. The results will be shown in a table similar to table C-25.3 indicating the requirement and measured value or indications of capability.

Table C-25.3. Resynchronization Header Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
59	4.5.7(1)	When a receiving data controller detects a message or burst synchronization error, or one of several other errors described in 5.3.7, an RSYNC burst shall be transmitted to signal the error condition.	The receiving terminal sends a RSYNC.	Refer to data collection form D-25.		
60	4.5.7(2)	The RSYNC burst shall be sent in lieu of an ACK burst.	The receiving terminal sends a RSYNC.	Refer to data collection form D-25.		
216	5.3.1.1(9)	A RSYNC shall be sent in lieu of an ACK for such errors.	A RSYNC is sent in lieu of an ACK.	Refer to data collection form D-25		

Table C-25.3. Resynchronization Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
281	5.3.7(13)	If a burst with an improper ID is received, and if an ACK is required, the receiving data controller shall reply with an RSYNC to signal the error condition.	The receiving terminal sends a RSYNC.	Refer to data collection form D-25.		
[redacted]	[redacted]	[redacted] by the transmitting data controller.	[redacted] new probe sent by the transmitting data controller.	Refer to [redacted] collection form D-25	[redacted]	
284	5.3.7(16)	An RSYNC burst shall be sent instead of an ACK for those conditions specified here.	An RSYNC burst shall be sent instead of an ACK.	Refer to data collection form D-25		

[redacted]

Table C-25.3. Resynchronization Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
288	5.3.7.2(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	The transmitting data controller aborts a PTP message transfer or drops this destination from an MC message transfer.	Refer to data collection form D-25		
289	5.3.7.3(1)	Repeated message. This RSYNC code shall indicate that the receiving data controller has previously received and correctly decoded the message.	Repeated message RSYNC code is sent to indicate that the receiving data controller has previously received and correctly decoded the message.	Refer to data collection form D-25		
290	5.3.7.3(2)	Upon receiving this RSYNC code, the transmitting data controller shall determine that the message was correctly received…	The transmitting data controller shall determine that the message was correctly received.	Refer to data collection form D-25		
291	5.3.7.3(3)	…and shall terminate transfer of data to this destination.	The transmitting data controller terminates transfer of data to this destination.	Refer to data collection form D-25		
292	5.3.7.4(1)	Unexpected source ID. This RSYNC code shall identify receipt of a burst from the unexpected source ID.	Unexpected source ID RSYNC code is sent identify receipt of a burst from the unexpected source ID.	Refer to data collection form D-25		
293	5.3.7.4(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	The transmitting data controllers aborts a PTP message transfer or drops this destination from an MC message transfer.	Refer to data collection form D-25		

Table C-25.3. Resynchronization Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
294	5.3.7.5(1)	Receiver lost. This RSYNC code shall indicate that the receiving data controller has missed the first burst(s) of a valid transmission, as indicated by the start-of-message flag in the header.	Receiver lost RSYNC code is sent to indicate that the receiving data controller has missed the first burst(s) of a valid transmission.	Refer to data collection form D-25		
295	5.3.7.5(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	The transmitting data controller aborts a PTP message transfer or drops this destination from an MC message transfer.	Refer to data collection form D-25		
296	5.3.7.6(1)	Receiver busy. This RSYNC code shall indicate to the transmitting data controller that the receiving data controller is busy.	Receiver busy RSYNC code is sent to indicate to the transmitting data controller that the receiving data controller is busy.	Refer to data collection form D-25		
297	5.3.7.6(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	The transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	Refer to data collection form D-25		
298	5.3.7.7(1)	Data terminal non-responsive. This RSYNC code shall indicate to the transmitting data controller that the receiving data controller's attached data terminal device will not accept data.	Data terminal non-responsive RSYNC code is sent to indicate to the transmitting data controller that the receiving data controller's attached data terminal device will not accept data.	Refer to data collection form D-25		

Table C-25.3. Resynchronization Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
299	5.3.7.7(2)	Upon receiving this RSYNC code, the transmitting data controller shall abort a PTP message transfer or drop this destination from an MC message transfer.	The transmitting data controller aborts a PTP message transfer or drops this destination from an MC message transfer.	Refer to data collection form D-25		
300	5.3.7.8	<u>Incompatible packet format.</u> This RSYNC code shall not be used in this revision of the MIL-STD.	Not testable.			
301	5.3.7.9	<u>Incompatible burst type.</u> This RSYNC code shall not be used in this revision of the MIL-STD.	Not testable.			
446	5.4.7a	<u>Burst Type.</u> This 4-bit field shall identify the burst type as Resynchronization, according to table XIII [of the MIL-STD].	Burst Type field identifies the burst type as Resynchronization, according to table XIII [of the MIL-STD].	Refer to data collection form D-25		
447	5.4.7b	<u>Requested Code Rate.</u> This 4-bit field shall specify the desired code rate of the receiving data controller, as given in table XVII [of the MIL-STD].	Requested Code Rate field specifies the desired code rate of the receiving data controller, as given in table XVII [of the MIL-STD].	Refer to data collection form D-25		
448	5.4.7c	<u>Reason Code.</u> This 8-bit field shall be used to specify certain error conditions.	Reason Code field specifies error conditions.	Refer to data collection form D-25		
449	5.4.7d(1)	<u>Revision Level.</u> This 8-bit field shall be used to specify the waveform revision level.	Revision Level field specifies the waveform revision level.	Refer to data collection form D-25		
450	5.4.7d(2)	This field shall be revision 0 for data controllers built to this revision of the MIL-STD.	Revision Level field is set to 0.	Refer to data collection form D-25		
451	5.4.7e(1)	<u>Destination.</u> This 8-bit field shall contain the network ID of the burst destination.	Destination field contains the network ID of the burst destination.	Refer to data collection form D-25		

Table C-25.3. Resynchronization Header Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
452	5.4.7e(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-25		
453	5.4.7f(1)	Source. This 8-bit field shall contain the network ID of the burst source.	Source field contains the network ID of the burst source.	Refer to data collection form D-25		
454	5.4.7f(2)	Values from 1 to 64 shall be valid.	Values from 1 to 64 are accepted.	Refer to data collection form D-25		
455	5.4.7g	Burst ID. This 4-bit field represents the burst count. It shall be set to the burst ID of the data burst in error.	Burst ID field is set to the burst ID of the data burst in error.	Refer to data collection form D-25		
456	5.4.7h	Message ID. This 4-bit field represents the message count. It shall be set to the message ID of the data burst in error.	Message field is set to the message ID of the data burst in error.	Refer to data collection form D-25		
457	5.4.7i(1)	CRC. This field shall consist of 3 bytes: CRC lo, CRC mid, and CRC hi.	CRC field consists of 3 bytes: CRC lo, CRC mid, and CRC hi.	Refer to data collection form D-25		
458	5.4.7i(2)	The 24-bit field shall be the header CRC: LSB first, MSB last.	The 24-bit field is the header CRC: LSB first, MSB last.	Refer to data collection form D-25		
459	5.4.7j	Flush. This 8-bit field shall be filled with zeros, and these bits are the encoder flush bits.	Flush field is filled with zeros.	Refer to data collection form D-25		

Legend:
ACK - Acknowledgement Burst
CRC - Cyclic Redundancy Check
ID - Identifier
LSB - Least Significant Bit
MC - Multicast
MIL-STD - Military Standard
MSB - Most Significant Bit
PB - Probe Burst
PTP - Point-to-Point
RSYNC - Resynchronization Burst

C-26 SUBTEST 26. CARRIER SENSE MULTIPLE ACCESS (CSMA) VERIFICATION

C-26.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for CSMA.

C-26.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 48, 61,62, and 239.

C-26.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-26.1.

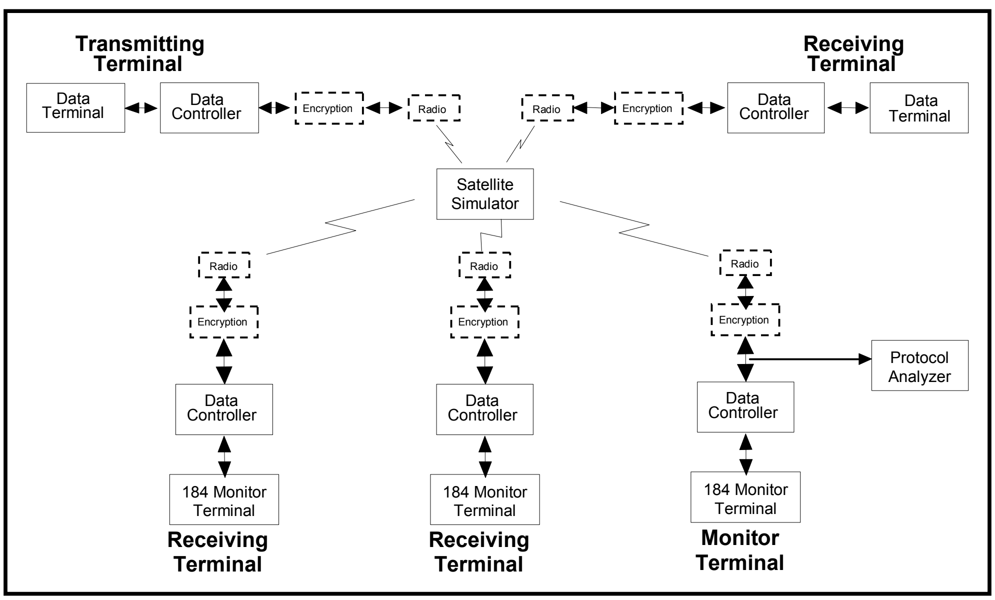

Figure C-26.1. CSMA Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-26.1.

Table C-26.1. CSMA Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-26.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_CSMA_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_CSMA _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	N/A	Record results on data collection form D-26.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ PTP_CSMA _5K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_CSMA_5K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	N/A	Record results on data collection form D-26.
13	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
14	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_CSMA _5K.txt	

Table C-26.1. CSMA Test Procedures (continued)

Step	Action	Settings/Action	Result
15	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_CSMA _5K.txt	
16	Verify that the MPB, PA, MC and ACK bursts are received.	N/A	Record results on data collection form D-26.
17	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
18	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_CSMA _100K.txt	
19	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_CSMA _100K.txt	
20	Verify that the MPB, PA, MC and ACK bursts are received.	N/A	Record results on data collection form D-26.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
CSMA - Carrier Sense Multiple Access
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
N/A - Not Applicable
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

C-26.4 Presentation of Results. The results will be shown in a table similar to table C-26.2 indicating the requirement and measured value or indications of capability.

Table C-26.2. CSMA Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
48	4.5.2.1	To reduce the possibility of interfering with other data controllers sharing a channel, data controllers shall inhibit transmissions when channel activity is detected.	Message is retransmitted without incrementing burst ID.	Refer to data collection form D-26.		

Table C-26.2. CSMA Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
61	5.1.1(1)	The data controller shall wait for an idle channel, as determined by the carrier sensing mechanism (see 5.3.2.1)…	The data controller waits for an idle channel.	Refer to data collection form D-26.		
62	5.1.1(2)	…and shall use the backoff algorithm defined in 5.3.2.2 to determine when to transmit.	The data controller uses the backoff algorithm defined in 5.3.2.2 to determine when to transmit.	Refer to data collection form D-26.		
239	5.3.2(1)	Prior to transmitting a new message, the data controller shall determine that the channel is idle, as described in 5.3.2.1.	The data controller determines that the channel is idle, as described in 5.3.2.1.	Refer to data collection form D-26.		

Legend:
CSMA - Carrier Sense Multiple Access
ID - Identifier
MIL-STD - Military Standard
UUT - Unit Under Test

C-27 SUBTEST 27. BACK-OFF TIME VERIFICATION

C-27.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for back-off times.

C-27.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 240-256.

C-27.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-27.1.

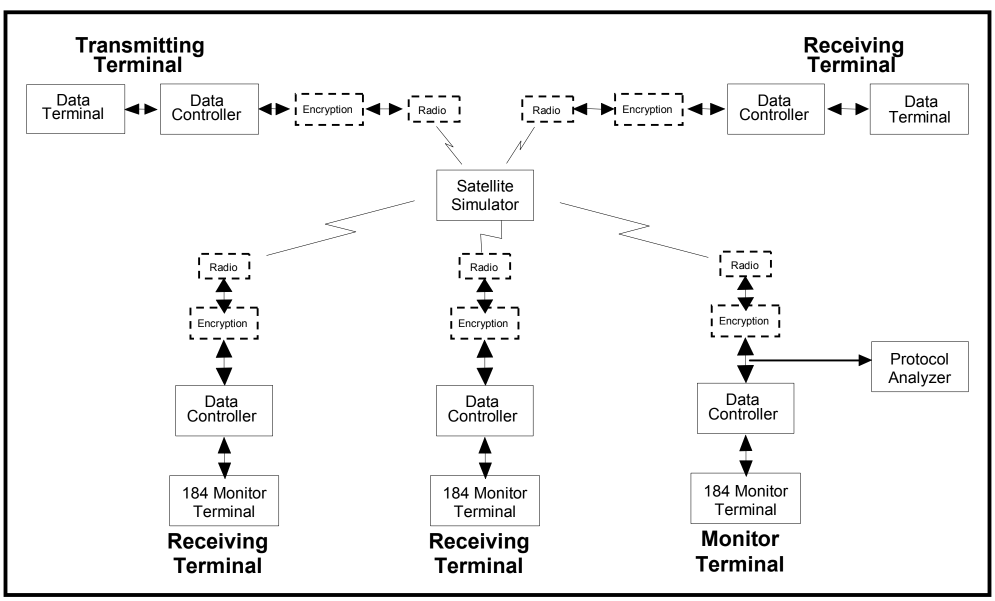

Figure C-27.1. Back-Off Time Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-27.1.

Table C-27.1. Back-Off Time Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-27.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Backoff_Time_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Backoff_Time_5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-27.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-27.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ PTP_CSMA _5K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_CSMA_5K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-27.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-27.
13	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
14	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_CSMA _5K.txt	

Table C-27.1. Back-Off Time Test Procedures (continued)

Step	Action	Settings/Action	Result
15	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_CSMA _5K.txt	
16	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-27.3 for an example of a properly transmitted MC message.	Record results on data collection form D-27.
17	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
18	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_CSMA _100K.txt	
19	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_CSMA _100K.txt	
20	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-27.3 for an example of a properly transmitted MC message.	Record results on data collection form D-27.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-27.2. PTP Back-Off Time Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-27.3. MC Flow Control Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	PA - Probe Acknowledgement
ACK - Acknowledgement Burst	ID - Identifier	PRI - Priority
ARQ - Automatic Repeat Request	MC - Multicast	REQ - Request
BER - Bit Error Ratio	Mesg - Message	REV - Revision
EOM - End-of-Message	MPB - Multicast Probe Burst	SOM - Start-of-Message

C-27.4 Presentation of Results. The results will be shown in a table similar to table C-27.4 indicating the requirement and measured value or indications of capability.

Table C-27.4. Back-Off Time Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
240	5.3.2(2)	Prior to transmitting message bursts or channel probes, data controllers shall comply with the backoff algorithm described in 5.3.2.2.	Data controllers comply with the backoff algorithm described in 5.3.2.2.	Refer to data collection form D-27.		
241	5.3.2.1(1)	For messages for which probing is not enabled, the fixed period shall be at least equal to the first slot timeout value specified in table VIIIa [of the MIL-STD].	Message retransmittion without incrementing burst ID.	Refer to data collection form D-27.		
242	5.3.2.1(2)	If channel probing is enabled, the length of the fixed period shall depend on channel traffic.	If channel probing is enabled, the length of the fixed period changes depending on channel traffic.	Refer to data collection form D-27.		

Table C-27.4. Back-Off Time Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
243	5.3.2.1(3)	If channel traffic cannot be decoded (processed in accordance with this MIL-STD), the fixed period shall be equal to the ninth slot timeout value specified in table VIIIa [of the MIL-STD].	If channel traffic cannot be decoded, the fixed period is equal to the ninth slot timeout value specified in table VIIIa [of the MIL-STD].	Refer to data collection form D-27.		
244	5.3.2.1(4)	If channel traffic can be decoded, the fixed period shall be in accordance with table VIIIb [of the MIL-STD].	If channel traffic is decoded, the fixed period is in accordance with table VIIIb [of the MIL-STD].	Refer to data collection form D-27.		
245	5.3.2.2(1)	When channel activity is detected during the backoff period, the data controller shall exit the backoff protocol and wait for the channel to become inactive.	The data controller exits the backoff protocol and wait for the channel to become inactive.	Refer to data collection form D-27.		
246	5.3.2.2(2)	If channel probing is not enabled, the first message burst backoff period, in msec, shall be based on a uniformly distributed random number between 0 and 4 seconds.	The first message burst backoff period, in msec, is based on a uniformly distributed random number between 0 and 4 seconds.	Refer to data collection form D-27.		
247	5.3.2.2(3)	Subsequent bursts, of the same message, shall employ random backoff periods only if unexpected channel activity is detected.	Subsequent bursts, of the same message, employ random backoff periods only if unexpected channel activity is detected.	Refer to data collection form D-27.		

Table C-27.4. Back-Off Time Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
248	5.3.2.2(4)	For these bursts the random backoff period, in msec, shall be based on a uniformly distributed random number between 0 and 1 second.	Subsequent bursts use random backoff period based on a uniformly distributed random number between 0 and 1 second.	Refer to data collection form D-27.		
249	5.3.2.2(5)	If channel probing is enabled, the backoff period shall be based on a uniformly distributed random number, in msec, within a range from 0 to 2^b seconds, where *b* is called the backoff count.	Not testable.			
250	5.3.2.2(6)	The backoff count, for the first message probe, initially shall be 1…	Not testable.			
251	5.3.2.2(7)	…and shall be incremented by 1 each time an attempt to capture the channel is unsuccessful.	Not testable.			
252	5.3.2.2(8)	Each time the backoff count is incremented, a new, uniformly distributed random number between 0 and 2^b x 1000 msec shall then be computed.	Not testable.			
253	5.3.2.2(9)	If, for the rate in use, 2^b x 1000 exceeds the maximum backoff period specified in table IX [of the MIL-STD], the value in the table shall be the upper bound for the random number selected.	Not testable.			

Table C-27.4. Back-Off Time Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
254	5.3.2.2(10)	This process shall be repeated until an attempt to capture the channel is successful or the maximum attempts to capture the channel have been attempted.	Not testable.			
255	5.3.2.2(11)	For PTP services, when the maximum backoff interval or maximum attempts to capture the channel have been reached, the data controller shall abandon the message and should notify the operator.	Operator is notified of aborted message.	Refer to data collection form D-27		
256	5.3.2.2(12)	For MC services, if all destinations are non-responsive, and the maximum backoff interval or the maximum attempts to capture the channel have been reached, the data controller shall abandon the message and should notify the operator.	Operator is notified of aborted message.	Refer to data collection form D-27.		

Legend:
ID - Identifier
MC - Multicast
MIL-STD - Military Standard
msec - milliseconds
PTP - Point-to-Point

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C-28 SUBTEST 28. TURN AROUND TIME VERIFICATION

C-28.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for times.

C-28.2 Criteria. The system under test must meet requirement 217 as stated in MIL-STD-188-184 as listed in appendix B.

C-28.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-28.1.

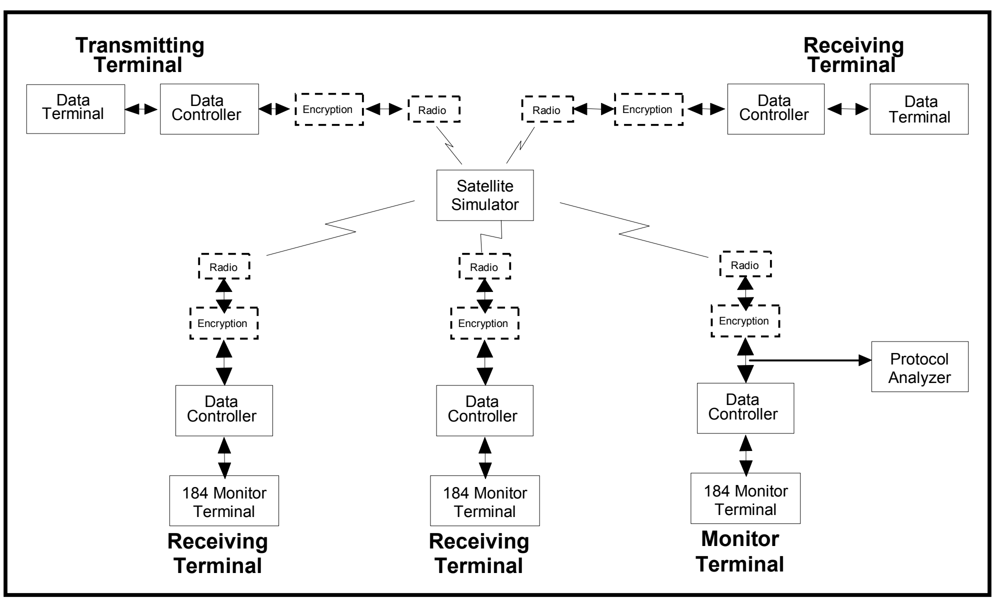

Figure C-28.1. Turn Around Time Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-28.1.

Table C-28.1. Turn Around Time Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-28.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Mode_Burst_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Mode_Burst _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-28.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-28.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Mode_Burst _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Mode_Burst _100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-28.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-28.
13	Analyze the time difference between PTP message and the ACK message.	Compare time to the turn around time requirement specified in table V [of the MIL-STD].	Record results on data collection form D-28.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-28.2. PTP Turn Around Time Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-28.3. Turn Around Time Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

C-28.4 Presentation of Results. The results will be shown in a table similar to table C-28.3 indicating the requirement and measured value or indications of capability.

Table C-28.4. Turn Around Time Test Results

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
217	5.3.1.1.1	Upon receipt of PTP burst, the receiving data controller shall format and send an ACK within the turnaround time specified in table V [of the MIL-STD].	ACK is transmitted within the turnaround time specified in table V [of the MIL-STD].	Refer to data collection form D-28.		

Legend:
ACK - Acknowledgement Burst
MIL-STD - Military Standard
PTP - Point-to-Point

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C-29 SUBTEST 29. ACKNOWLEDGEMENT TIMEOUT VERIFICATION OF POINT-TO-POINT MESSAGES

C-29.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for acknowledgement timeouts of point-to-point messages.

C-29.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 218-220.

C-29.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-29.1.

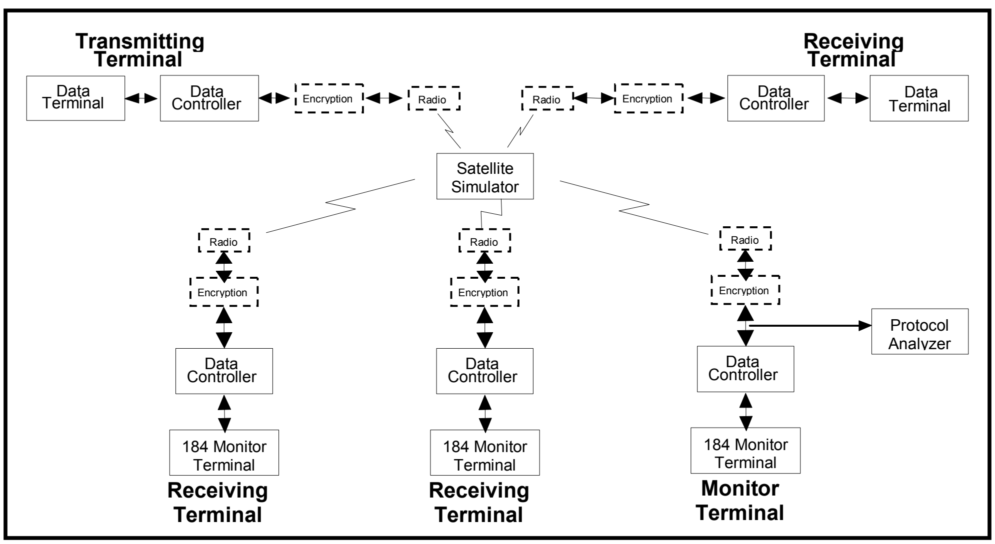

Figure C-29.1. Acknowledgement Timeout (PTP) Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-29.1.

Table C-29.1. Acknowledgement Timeout (PTP) Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-29.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ACK_Timeout_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ACK_Timeout _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-9.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-29.
9	Analyze the time difference between PTP message and the ACK message.	Compare time to the turn around time requirement specified in table V [of the MIL-STD].	Record results on data collection form D-29.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Reques
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-29.2. Acknowledgement Timeout (PTP) Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

C-29.4 Presentation of Results. The results will be shown in a table similar to table C-29.3 indicating the requirement and measured value or indications of capability.

Table C-29.3. Acknowledgement Timeout (PTP) Test Results

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
218	5.3.1.1.2(1)	The ACK delay shall be measured from the end of the transmitted burst to the receipt of the last bit of the ACK header kernel.	The ACK delay meets the ACK timeout period, specified in table VI [of the MIL-STD].	Refer to data collection form D-29.		
219	5.3.1.1.2(2)	If the ACK delay exceeds the ACK timeout period, specified in table VI [of the MIL-STD], the transmitting data controller shall timeout and resend the burst, except as specified in 5.3.1.1.3.	The ACK delay exceeds the ACK timeout period, specified in table VI [of the MIL-STD], the transmitting data controller times out and resends the burst.	Refer to data collection form D-29.		
220	5.3.1.1.3(1)	The previous burst shall be retransmitted if an ACK is not received within the timeout period, without incrementing the burst ID.	The previous burst is retransmitted if an ACK is not received within the timeout period, without incrementing the burst ID.	Refer to data collection form D-29.		

Legend:

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C-30 SUBTEST 30. ACKNOWLEDGEMENT TIMEOUT VERIFICATION OF MULTICAST MESSAGES

C-30.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for acknowledgement timeouts of multicast messages.

C-30.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 223-227, 231-234, and 238.

C-30.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-30.1.

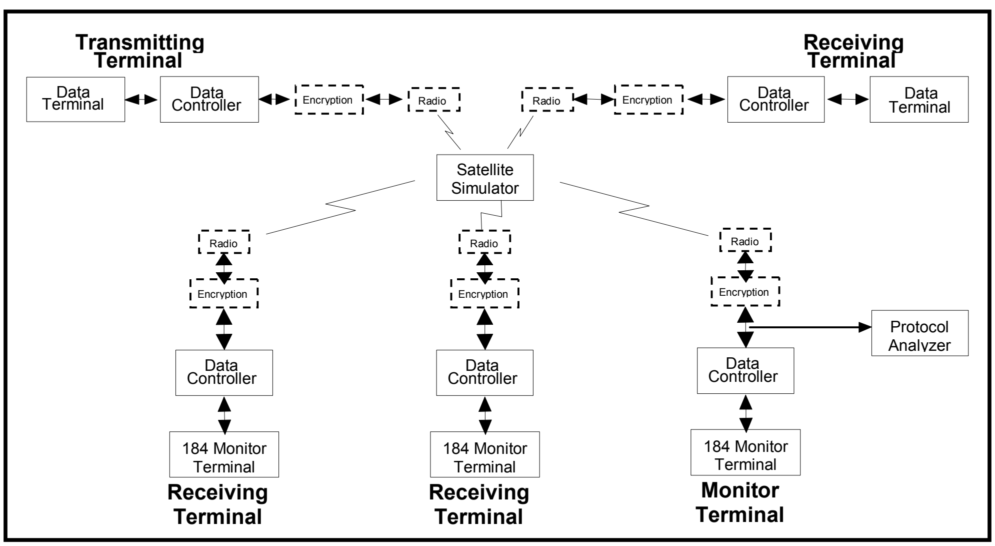

Figure C-30.1. Acknowledgement Timeout (MC) Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-30.1.

Table C-30.1. Acknowledgement Timeout (MC) Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-30.1.	
2	Configure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\ MC_ACK_Timeout _5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ MC_ACK_Timeout _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-9.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-30.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MC - Multicast
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-30.2. Acknowledgement Timeout (MC) Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
MPB - Multicast Probe Burst
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

C-30.4 Presentation of Results. The results will be shown in a table similar to table C-30.3 indicating the requirement and measured value or indications of capability.

Table C-30.3. Acknowledgement Timeout (MC) Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
223	5.3.1.2(1)	As described in 4.5.1.2, the MC acknowledgment protocol shall provide explicit polled scheduling of acknowledgment times.	The MC acknowledgment protocol provides explicit polled scheduling of acknowledgment times.	Refer to data collection form D-30.		
224	5.3.1.2(2)	Each of the MC destinations shall respond in a different time slot following the end of the MC or MPB burst.	Each of the MC destinations responds in a different time slot following the end of the MC or MPB burst.	Refer to data collection form D-30.		
225	5.3.1.2(3)	There shall be one acknowledgment time slot for each MC destination.	There is one acknowledgment time slot for each MC destination.	Refer to data collection form D-30.		
226	5.3.1.2(4)	The time slots shall be arranged in ascending order by address.	The time slots are arranged in ascending order by address.	Refer to data collection form D-30.		
227	5.3.1.2(5)	The lowest of the specified destinations shall transmit its ACK in the first slot, followed by the next lowest in the second slot, and so on.	The lowest of the specified destinations transmit its ACK in the first slot, followed by the next lowest in the second slot, and so on.	Refer to data collection form D-30.		
231	5.3.1.2.1(1)	The ACK slot period for single-hop, secure, UHF SATCOM channels shall be as defined in table VII [of the MIL-STD].	The ACK slot period for single-hop, secure, UHF SATCOM channels are as defined in table VII [of the MIL-STD].	Refer to data collection form D-30.		

Table C-30.3. Acknowledgement Timeout (MC) Test Results (continued)

Reference Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
232	5.3.1.2.1(2)	Transmissions shall be prohibited during this guard time.	Transmissions are prohibited during this guard time.	Refer to data collection form D-30.		
233	5.3.1.2.1(3)	The slot times shall be referenced to the receiving data controller, as illustrated in figure 21 [of the MIL-STD] (see section 5.5.1).	The slot times are referenced to the receiving data controller, as illustrated in figure 21 [of the MIL-STD] (see section 5.5.1).	Refer to data collection form D-30.		
234	5.3.1.2.1(4)	The first slot shall begin at the end of the received MC burst.	The first slot begins at the end of the received MC burst.	Refer to data collection form D-30.		
238	5.3.1.2.2(4)	The timeout values for MC ACKs on a single-hop, secure, UHF SATCOM channel shall be as defined in table VIIIa [of the MIL-STD].	The timeout values for MC ACKs are as defined in table VIIIa [of the MIL-STD].	Refer to data collection form D-30.		

Legend:
ACK - Acknowledgement Burst
MC - Multicast
MIL-STD - Military Standard
MPB - Multicast Probe Burst
SATCOM - Satellite Communications
UHF - Ultra High Frequency

C-31 SUBTEST 31. PERFORMANCE VERIFICATION

C-31.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for performance.

C-31.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 460-473.

C-31.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-31.1.

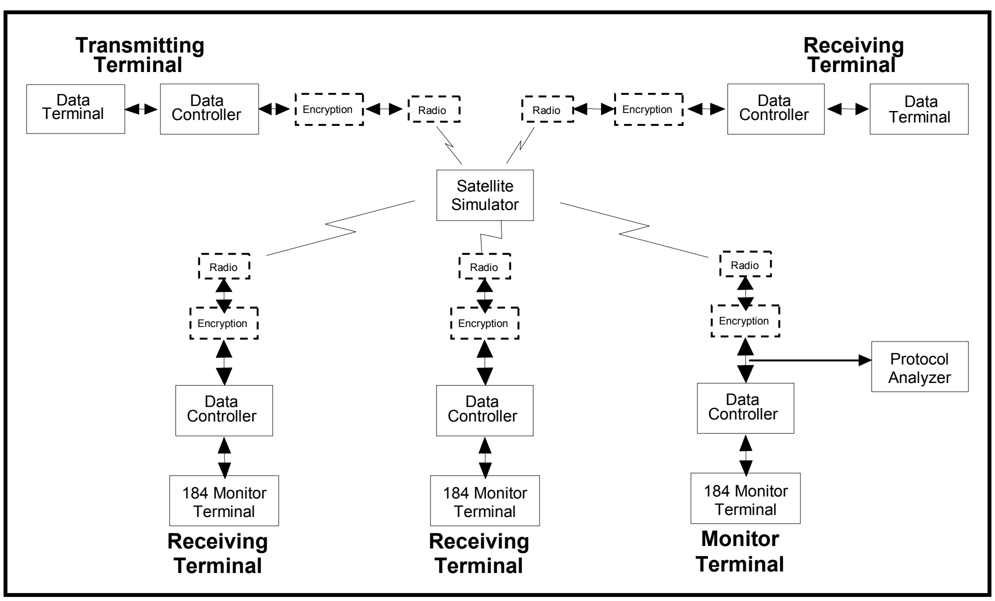

Figure C-31.1. Performance Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-31.1.

Table C-31.1. Performance Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-31.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Performance_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Performance_5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-31.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-31.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Performanc_100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Performance_100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-31.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-31.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Performanc_5K.txt	

Table C-31.1. Performance Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Performance_5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are ree ra48e		

Table C-31.1. Performance Test Procedures (continued)

Step	Action	Settings/Action	Result
34	Verify that the BC bursts are received.	Refer to table C-31.4 for an example of a properly transmitted BC message.	Record results on data collection form D-31.

Legend:	ID - Identifier	PB - Probe Burst
ACK - Acknowledgment Burst	Kbyte - Kilobyte	PTP - Point-to-Point
ARQ - Automatic Repeat Request	MC - Multicast	txt - Text file extension
BC - Broadcast	MPB - Multicast Probe Burst	UUT - Unit Under Test
FEC - Forward Error Correction	PA - Probe Acknowledgement	

Table C-31.2. PTP Performance Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:	ID - Identifier	PTP - Point-to-Point
ACK - Acknowledgement Burst	MC - Multicast	REQ - Request
ARQ - Automatic Repeat Request	Mesg - Message	REV - Revision
BER - Bit Error Ratio	PA - Probe Acknowledgement	SOM - Start-of-Message
EOM - End-of-Message	PB - Probe Burst	
FEC - Forward Error Correction	PRI - Priority	

Table C-33.3. MC Performance Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
18:07:24	MPB	1	2 5 6 7 8 9	8	1	BER 0% ARQ REV 1 PRI 0
18:07:25	PA	2	1	8	1	BER 0% REV 1 PRI 0 REQ 1
18:07:44	MC	1	2	1	13	BER 0% FEC 1 REPEATS 0 PACKETS 4 ARQ SOM EOM DESTUFF
18:07:45	ACK	2	1	1	13	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	PA - Probe Acknowledgement
ACK - Acknowledgement Burst	ID - Identifier	PRI - Priority
ARQ - Automatic Repeat Request	MC - Multicast	REQ - Request
BER - Bit Error Ratio	Mesg - Message	REV - Revision
EOM - End-of-Message	MPB - Multicast Probe Burst	SOM - Start-of-Message

Table C-31.4. BC Performance Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
21:45:02	BC	1	255	1	3	BER 0% FEC 1 PACKETS 1 SOM EOM
Legend: BC - Broadcast Message BER - Bit Error Ratio			EOM - End-of-Message FEC - Forward Error Correction ID - Identifier			Mesg - Message SOM - Start-of-Message

C-31.4 Presentation of Results. The results will be shown in a table similar to table C-31.5 indicating the requirement and measured value or indications of capability.

Table C-31.5. Performance Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
460	5.5.1(1)	Performance, defined in 5.5.2, shall be based on the average time to transfer a long (100,000-byte) and a short (5,000-byte) message error-free over a secure, UHF SATCOM channel.	Message is transmitted within the allowed time.	Refer to data collection form D-31.		
461	5.5.1(2)	Performance shall be averaged over four messages at the channel BER defined in 5.5.2.	Message is transmitted within the BER defined in 5.5.2.	Refer to data collection form D-31.		
461	5.5.1(2)	Performance shall be averaged over four messages at the channel BER defined in 5.5.2.	Not testable.			
462	5.5.1(3)	Five messages shall be sent at each BER,…	Not testable.			

Table C-31.5. Performance Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
463	5.5.1(4)	…and the average shall be calculated based on the four lowest measurements.	Not testable.			
464	5.5.1(5)	The following shall be used in performance testing: a. a 25-kHz UHF SATCOM channel or simulated 25-kHz channel, b. a UHF SATCOM radio, c. a KY-57 cryptographic device, and d. a data device capable of transmitting and receiving at 19,200 bps.	Not testable.			
465	5.5.1(6)	However, the performance results in 5.5.2 shall be met by all data controllers on secure, UHF SATCOM channels, regardless of the implementation-specific capabilities chosen.	The data controller meets the performance results in 5.5.2.			
466	5.5.1(7)	With the channel simulator set to the specified BER, and a nominal 250-msec delay, the average transmission time shall not exceed those given in 5.5.2.	The average transmission time does not exceed those given in 5.5.2.			

Table C-31.5. Performance Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
467	5.5.2(1)	End-to-end transmission time shall be defined as the average time to transfer a message error-free, from the first bit out of the transmitting data terminal to the last bit into the receiving data terminal (from point A to point D in figure 21 [of the MIL-STD]).	Not testable.			
468	5.5.2(2)	Over-the-air transmission time shall be defined as the average time required to transfer a message over the channel from one data controller to another (from point B to point C in figure 21 [of the MIL-STD]), including ACKs.	Not testable.			
469	5.5.2(3)	The short message-transmission times shall be as specified in table XXV [of the MIL-STD] for each code rate and BER identified.	The short message-transmission times are as specified in table XXV [of the MIL-STD] for each code rate and BER identified.			
470	5.5.2(4)	The transmitted user-message-length (without compression and coding) shall be 5,000 bytes.	Not testable. Verified before Data Controller tested.			
471	5.5.2(5)	Long message-transmission times shall be as specified in table XXVI [of the MIL-STD].	Long message-transmission times are as specified in table XXVI [of the MIL-STD].			

Table C-31.5. Performance Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
472	5.5.2(6)	The transmitted user-message-length (without compression and coding) shall be 100,000 bytes.	Not testable. Verified before Data Controller tested.			
473	5.5.2(7)	End-to-end times shall be identical for any message, compressed or uncompressed, that results in 5,000 or 100,000 bytes of user data transferred over the channel.	End-to-end times are identical for any message, compressed or uncompressed, that results in 5,000 or 100,000 bytes of user data transferred over the channel.			

Legend:
ACK _ Acknowledgement Burst
BER - Bit Error Ration
bps - bits per second
kHz - Kilohertz
MIL-STD - Military Standard
msec - milliseconds
SATCOM - Satellite Communications
UHF - Ultra High Frequency

C-32 SUBTEST 32. DEPACKETIZATION VERIFICATION

C-32.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for depacketization.

C-32.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 193-203.

C-32.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-32.1.

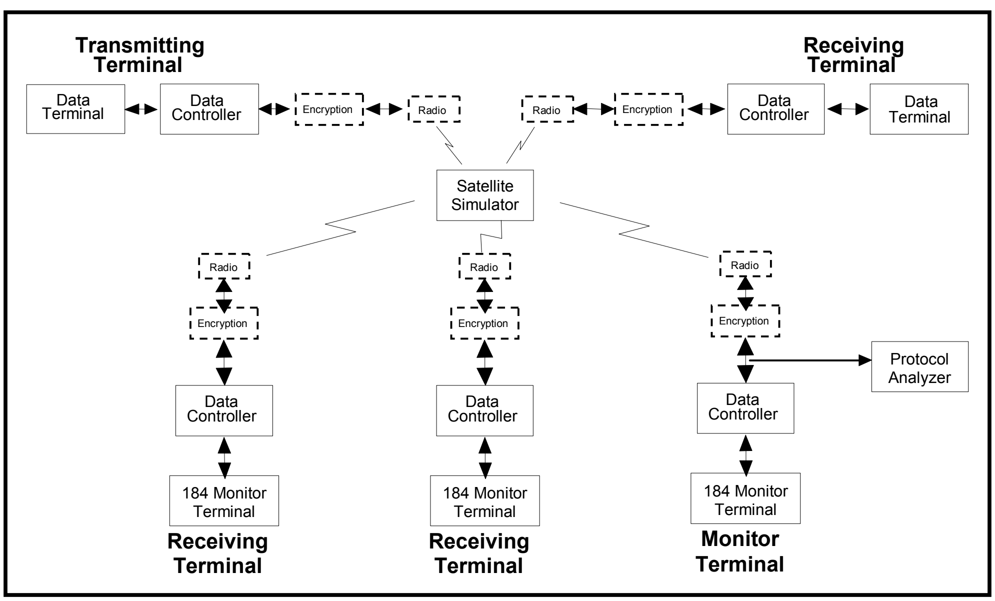

Figure C-32.1. Depacketization Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-32.1.

Table C-32.1. Depacketization Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-32.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Depacketization_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_Depacketization _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-32.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-32.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Depacketization _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Performance_100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-32.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-32.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Depacketization _5K.txt	

Table C-32.1. Depacketization Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Depacketization _5K.txt	
19	Verify that the MPB, PA, MC and ACK bursts are received.	Refer to table C-32.3 for an example of a properly transmitted MC message.	Record results on data collection form D-32.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Performance _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Depacketization _100K.txt	
23	Verify that the MPB, PA, MC and ACK bursts are received.	Refer to table C-32.3 for an example of a properly transmitted MC message.	Record results on data collection form D-32.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-32.2. PTP Depacketization Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-32.3. MC Depacketization Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PRI - Priority
REQ - Request
REV - Revision
SOM - Start-of-Message

C-32.4 Presentation of Results. The results will be shown in a table similar to table C-32.4 indicating the requirement and measured value or indications of capability.

Table C-32.4. Depacketization Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
193	5.2.2.5(1)	When ARQ is disabled, packets shall be reassembled in the order received.	Packets are reassembled in the order received.	Refer to data collection form D-32.		
194	5.2.2.5(2)	For PTP bursts, the ACK field of the ACK header extension shall contain a bit for each packet in the last acknowledged burst.	The ACK field of the ACK header extension shall contain a bit for each packet in the last acknowledged burst.	Refer to data collection form D-32.		

Table C-32.4. Depacketization Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
195	5.2.2.5(3)	Bits shall be set by the receiving data controller to indicate to the transmitting data controller those packets received in error.	Bits are set by the receiving data controller to indicate to the transmitting data controller those packets received in error.	Refer to data collection form D-32.		
196	5.2.2.5(4)	The receiving data controller shall use this information to distinguish between new and retransmitted packets.	The receiving data controller uses this information to distinguish between new and retransmitted packets.	Refer to data collection form D-32.		
197	5.2.2.5(5)	For MC bursts, the Packet Repeats field of the MC burst header shall identify to all destinations those packets in the last acknowledged burst that are being retransmitted.	The Packet Repeats field of the MC burst header identify to all destinations those packets in the last acknowledged burst that are being retransmitted.	Refer to data collection form D-32.		
198	5.2.2.5(6)	The receiving data controller shall use this information to distinguish between new and retransmitted packets.	The receiving data controller uses this information to distinguish between new and retransmitted packets.	Refer to data collection form D-32.		

Table C-32.4. Depacketization Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
199	5.2.2.5(7)	When ARQ is enabled, the CRC and any flush bits shall be stripped from the packets,…	Not testable.	Refer to data collection form D-32.		
200	5.2.2.5(8)	…and the receiving data controller shall use information in the ACK or MC header to correctly reassemble the transmitted message.	The receiving data controller uses information in the ACK or MC header to correctly reassemble the transmitted message.	Refer to data collection form D-32.		
201	5.2.2.5(9)	If the last packet is stuffed, as indicated by the appropriate bit in the header, it shall be unstuffed prior to reassembling the message.	The last packet is unstuffed.	Refer to data collection form D-32.		
202	5.2.2.5(10)	This shall be done by deleting the last byte in the packet and all immediately preceding bytes identical to it.	Not testable.	None.		
203	5.2.2.5(11)	Reassembled packets shall be decompressed, if necessary.	Reassembled packets are decompressed.	Refer to data collection form D-32.		

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
CRC - Cyclic Redundancy Check
MC - Multicast
MIL-STD - Military Standard
PTP - Point-to-Point

C-33 SUBTEST 33. HALF- AND FULL-DUPLEX VERIFICATION

C-33.1 Objective. To determine the extent of compliance to the requirements of Military Standard (MIL-STD)-188-184 for half and full duplex verification.

C-33.2 Criteria. The system under test must meet the following requirements stated in MIL-STD-188-184 as listed in appendix B: 22-24.

C-33.3 Test Procedures

a. Test Equipment Required

(1) Data Terminals (2)

(2) Unit Under Test (UUT) (2)

(3) MIL-STD-188-181 compliant radio (5)

(4) Satellite Simulator with noise generator

(5) Encryption Device (5)

(6) Protocol Analyzer

(7) MIL-STD-188-184E Monitor Terminal

b. Test Configuration. Configure the equipment as shown in figure C-33.1.

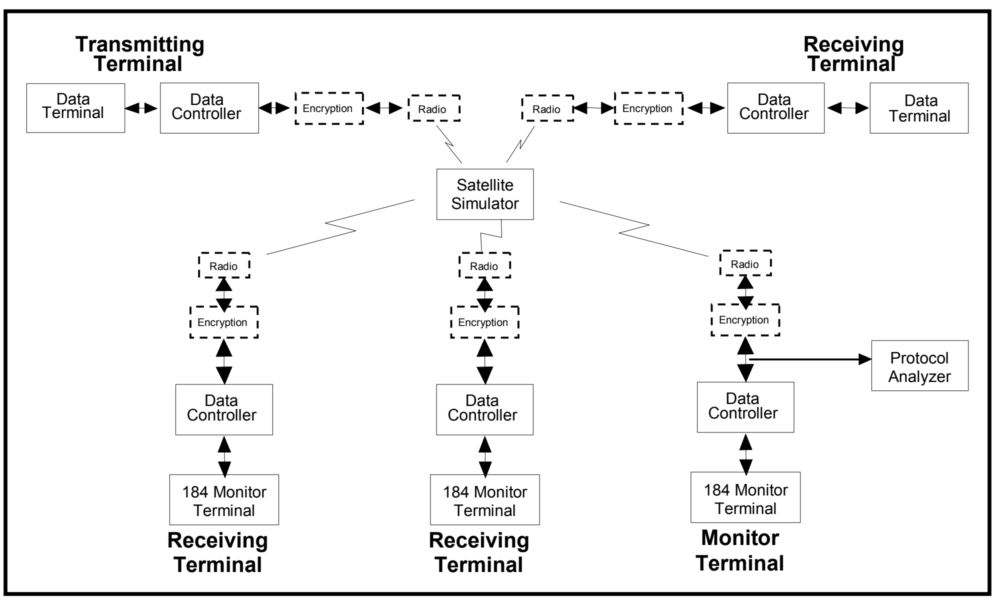

Figure C-33.1. Half and Full Duplex Data Controller Network Configuration

c. Test Conduct. The test procedures are listed in table C-33.1.

Table C-33.1. Half- and Full-Duplex Test Procedures

Step	Action	Settings/Action	Result
1	Connect the equipment.	As shown in figure C-33.1.	
2	Configure UUT to send a PTP message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
3	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
4	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
5	Send a PTP message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
6	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_Duplex_5K.txt	
7	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\ PTP_ Duplex _5K.txt	
8	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-33.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-33.
9	Send a PTP message (with ARQ) with a 100-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
10	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\PTP_ Duplex _100K.txt	
11	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\PTP_ Performance_100K.txt	
12	Verify that the PB, PA, PTP, and ACK bursts are received.	Refer to table C-33.2 for an example of a properly transmitted PTP message.	Record results on data collection form D-33.
13	Reconfigure UUT to send an MC message with probing and ACK enabled. Set the FEC rate to adaptive.	Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings.	
14	Configure 184E monitor Terminal.	Refer to appendix F for setup instructions.	
15	Configure Protocol Analyzer.	Refer to appendix F for setup instructions.	
16	Send an MC message (with ARQ) with a 5-Kbyte attachment to a terminal ID in the network.	To be determined when UUT is identified.	
17	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Duplex _5K.txt	

Table C-33.1. Half- and Full-Duplex Test Procedures (continued)

Step	Action	Settings/Action	Result
18	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Duplex _5K.txt	
19	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-33.3 for an example of a properly transmitted MC message.	Record results on data collection form D-33.
20	Send an MC message (with ARQ) with a 100-Kbyte attachment to 2 terminal IDs in the network.	To be determined when UUT is identified.	
21	Record the message on the 184E console.	Save traffic log to file. Name file: 184E\MC_ Duplex _100K.txt	
22	Record the message on the protocol analyzer.	Save traffic log to file. Name file: protocol analyzer\MC_ Duplex _100K.txt	
23	Verify that the MPB, PA, MC, and ACK bursts are received.	Refer to table C-33.3 for an example of a properly transmitted MC message.	Record results on data collection form D-33.

Legend:
ACK - Acknowledgment Burst
ARQ - Automatic Repeat Request
FEC - Forward Error Correction
ID - Identifier
Kbyte - Kilobyte
MPB - Multicast Probe Burst
PA - Probe Acknowledgement
PB - Probe Burst
PTP - Point-to-Point
txt - Text file extension
UUT - Unit Under Test

Table C-33.2. PTP Half- and Full-Duplex Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
16:26:10	PB	1	3	1	1	BER 2840% ARQ REV 1 PRI 0
16:26:13	PA	3	1	1	1	BER 0% REV 1 PRI 0 REQ NOT AVAILABLE
16:26:16	PTP	1	3	1	5	BER 3551% FEC 1 PACKETS 7 ARQ SOM EOM DESTUFF
16:26:20	ACK	3	1	1	5	BER 0% REPEATS 1 REQ 7/8 FLOW 256
16:26:23	PTP	1	3	2	5	BER 3267% FEC 7/8 PACKETS 5 ARQ EOM DESTUFF
16:26:27	ACK	1	3	2	5	BER 0% REPEATS 0 REQ NOT AVAILABLE FLOW 256

Legend:
ACK - Acknowledgement Burst
ARQ - Automatic Repeat Request
BER - Bit Error Ratio
EOM - End-of-Message
FEC - Forward Error Correction
ID - Identifier
MC - Multicast
Mesg - Message
PA - Probe Acknowledgement
PB - Probe Burst
PRI - Priority
PTP - Point-to-Point
REQ - Request
REV - Revision
SOM - Start-of-Message

Table C-33.3. MC Half- and Full-Duplex Example

Time	Type	Source	Destinations	Burst ID	Mesg ID	Comments
19:56:31	MC	1	3 5 7 9	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256 ARQ
19:57:31	ACK	7	1	2	15	BER 0% REPEATS 0 REQ 1 FLOW 256
19:57:43	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
19:58:53	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:00:04	MC	1	3 5 9	2	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:01:14	MC	1	7	3	15	BER 0% FEC 1 REPEATS 0 PACKETS 256 ARQ
20:02:09	ACK	7	1	3	15	BER 0% REPEATS 0 REQ 1 FLOW 256
20:02:16	MC	1	7	4	15	BER 0% FEC 1 REPEATS 0 PACKETS 49 ARQ EOM DESTUFF
20:02:22	ACK	7	1	4	15	BER 0% REPEATS 0 REQ 1 FLOW 256

Legend:	FEC - Forward Error Correction	REQ - Request
ACK - Acknowledgement Burst	ID - Identifier	REV - Revision
ARQ - Automatic Repeat Request	MC - Multicast	SOM - Start-of-Message
BER - Bit Error Ratio	Mesg - Message	
EOM - End-of-Message	PRI - Priority	

C-33.4 Presentation of Results. The results will be shown in a table similar to table C-33.4 indicating the requirement and measured value or indications of capability.

Table C-33.4. Half- and Full-Duplex Test Results

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
22	4.5(1)	The waveform protocols described in 4.5.1 through 4.5.7 and 5.3.1 through 5.3.7 shall be supported on both full- and half-duplex communications channels.	Data Controller supports on both full- and half-duplex communications channels.	Refer to data collection form D-33.		
23	4.5(2)	Message transfer shall be restricted to one direction at a time.	Message transfer is restricted to one direction at a time.	Refer to data collection form D-33.		

Table C-33.4. Half- and Full-Duplex Test Results (continued)

Requirement Number	MIL-STD Paragraph	Requirement	Result		Finding	
			Required Value	Measured Value	Met	Not Met
24	4.5(3)	Transmitting data controllers shall be able to receive ACKs and RSYNCs sent prior to the end of the burst.	Transmitting data controllers receive ACKs and RSYNCs sent prior to the end of the burst.	Refer to data collection form D-33.		

Legend:
ACK - Acknowledgement Burst   MIL-STD - Military Standard   RSYNC - Resynchronization Burst

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APPENDIX D

DATA COLLECTION FORMS

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DATA COLLECTION FORM D-1 SELECTABLE FEATURES	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-2
START OF MESSAGE

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-3 HEADER (GENERAL)	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-4 FILL, SPARE, AND STUFFED BITS	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-5 CODE COMBINING	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-6 CYCLIC REDUNDANCY CHECK				DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-7 NON-RESPONDING DATA CONTROLLERS				DATE: (DD/MMM/YY)
Reference #	Required Value	Measured Value	Pass	Fail
TEST TECHNICIAN:				
TEST DIRECTOR:				

DATA COLLECTION FORM D-8 MAXIMUM NUMBER OF RETRIES	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-9 RETRANSMISSION	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-10
CHANNEL QUALITY

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-11
SELECTABLE FEATURES

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

DATA COLLECTION FORM D-12 COMPRESSION	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-13
PACKET STRUCTURE

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-14
MODE AND BURST TYPES

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-15
BURST AND MESSAGE ID

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-16
TRANSMIT PROCESS

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-17
RECEIVE PROCESS

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-18
FLOW CONTROL

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-19
PROBE BURST HEADER

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-20
PROBE ACKNOWLEDGEMNT HEADER

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-21 MULTICAST PROBE HEADER			DATE: (DD/MMM/YY)	
Reference #	Required Value	Measured Value	Pass	Fail
TEST TECHNICIAN:				
TEST DIRECTOR:				

DATA COLLECTION FORM D-22 POINT-TO-POINT AND BRODACAST HEADER	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-23 ACKNOWLEDGEMENT HEADER	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-24 MULTICAST HEADER				DATE: (DD/MMM/YY)
Reference #	Required Value	Measured Value	Pass	Fail

DATA COLLECTION FORM D-25 RESYNCHRONIZATION HEADER	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

DATA COLLECTION FORM D-26 CARRIER SENSE MULTIPLE ACCESS (CSMA)	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-27
BACKOFF TIME

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-28 TURN AROUND TIME				DATE: (DD/MMM/YY)
Reference #	Required Value	Measured Value	Pass	Fail
TEST TECHNICIAN:				
TEST DIRECTOR:				

DATA COLLECTION FORM D-29 ACKNOWLEGEMENT TIMEOUT (PTP)	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

DATA COLLECTION FORM D-30 ACKNOWLEGEMENT TIMEOUT (MC)				DATE: (DD/MMM/YY)
Reference #	Required Value	Measured Value	Pass	Fail
TEST TECHNICIAN:				
TEST DIRECTOR:				

DATA COLLECTION FORM D-31 PERFORMANCE	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-32
DEPACKETIZATION

DATE:
(DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

DATA COLLECTION FORM D-33 **HALF- AND FULL-DUPLEX**	DATE: (DD/MMM/YY)

Reference #	Required Value	Measured Value	Pass	Fail

TEST TECHNICIAN:	
TEST DIRECTOR:	

MIL-STD-188-184 CONFORMANCE TEST PROCEDURES Event Log Form	DATE: (DD/MMM/YY)

Time (Z)	Initials	Event

TEST TECHNICIAN:	
DATA ENTRY TECHNICIAN:	TEST DIRECTOR:

APPENDIX E

REFERENCES

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REFERENCES

DEPARTMENT OF DEFENSE (DOD) DIRECTIVE

DOD Directive 4120.21, "Specifications and Standards Applications"

FEDERAL STANDARDS (FED-STD)

FED-STD-1037, "Glossary of Telecommunications Terms"

MILITARY STANDARDS (MIL-STD)

MIL-STD-188-184, “Interoperability and Performance Standard for the Data Controller Waveform”

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APPENDIX F

TEST EQUIPMENT SETUP PROCEDURES

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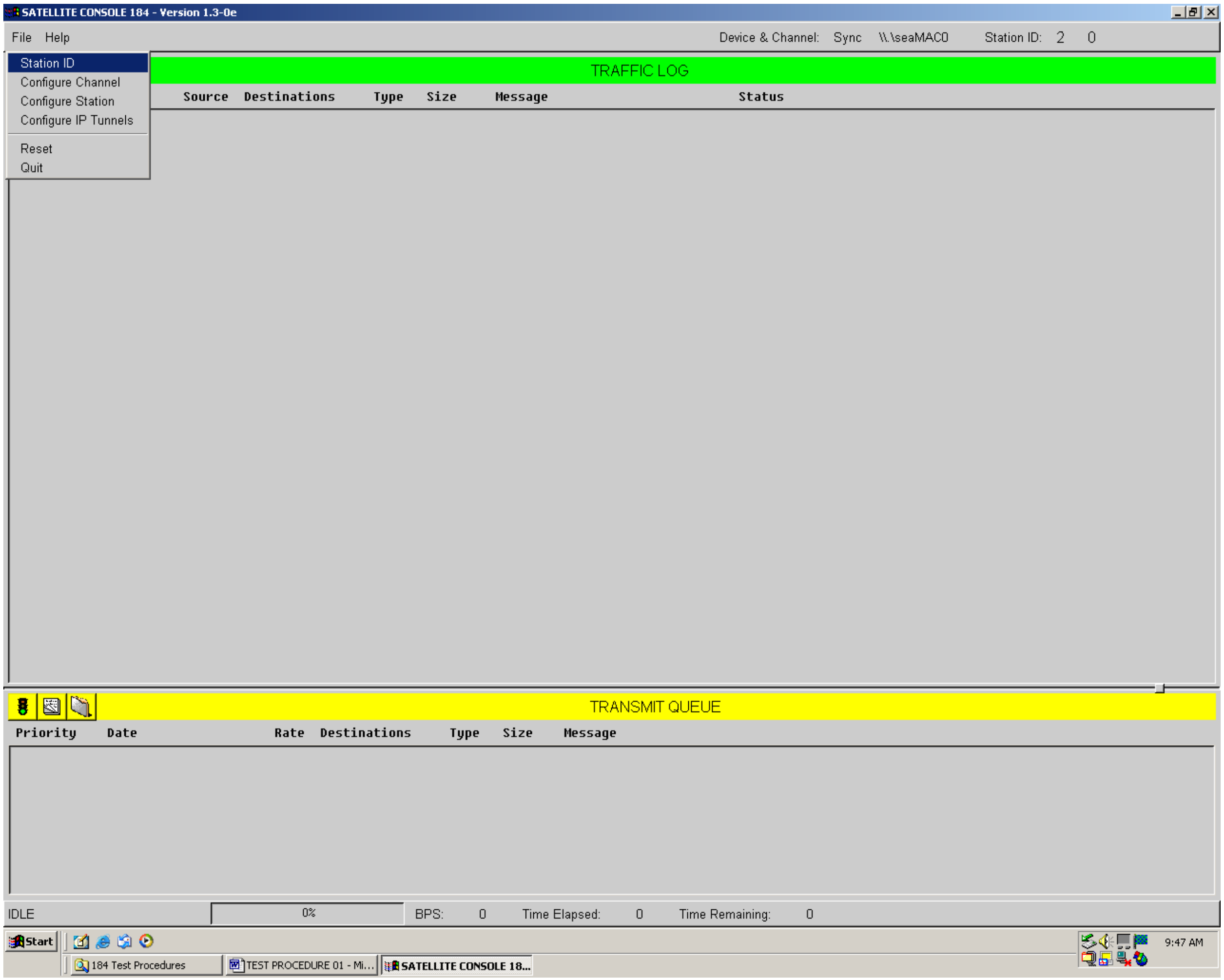
184E SATELLITE CONSOLE

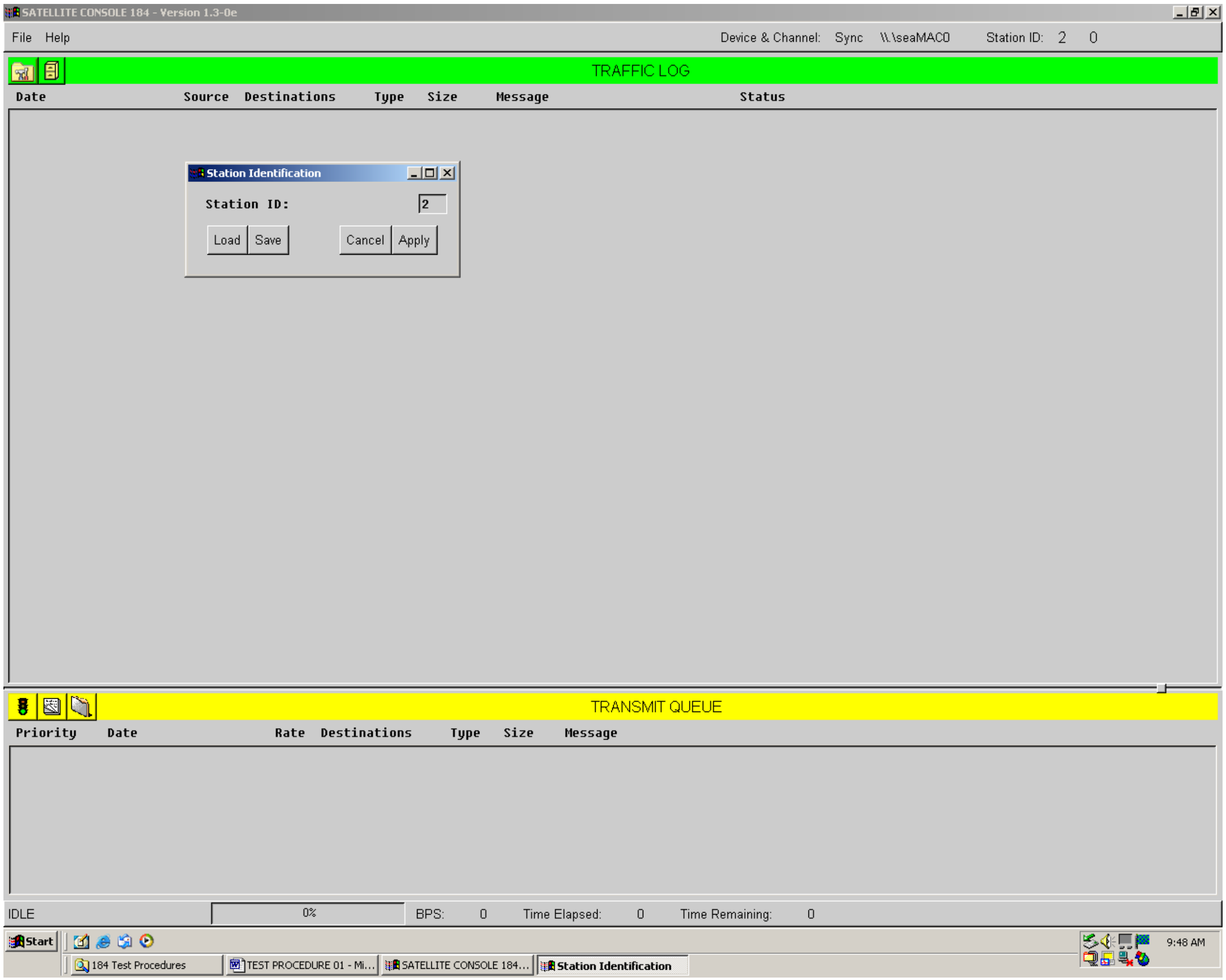
Enter the transmitting terminal and receiving terminal station ID, probing, acknowledgment mode, FEC code rate, and compression settings in the satellite console 184 program as follows:

a. Station ID

Under **File**, select **Station ID**.

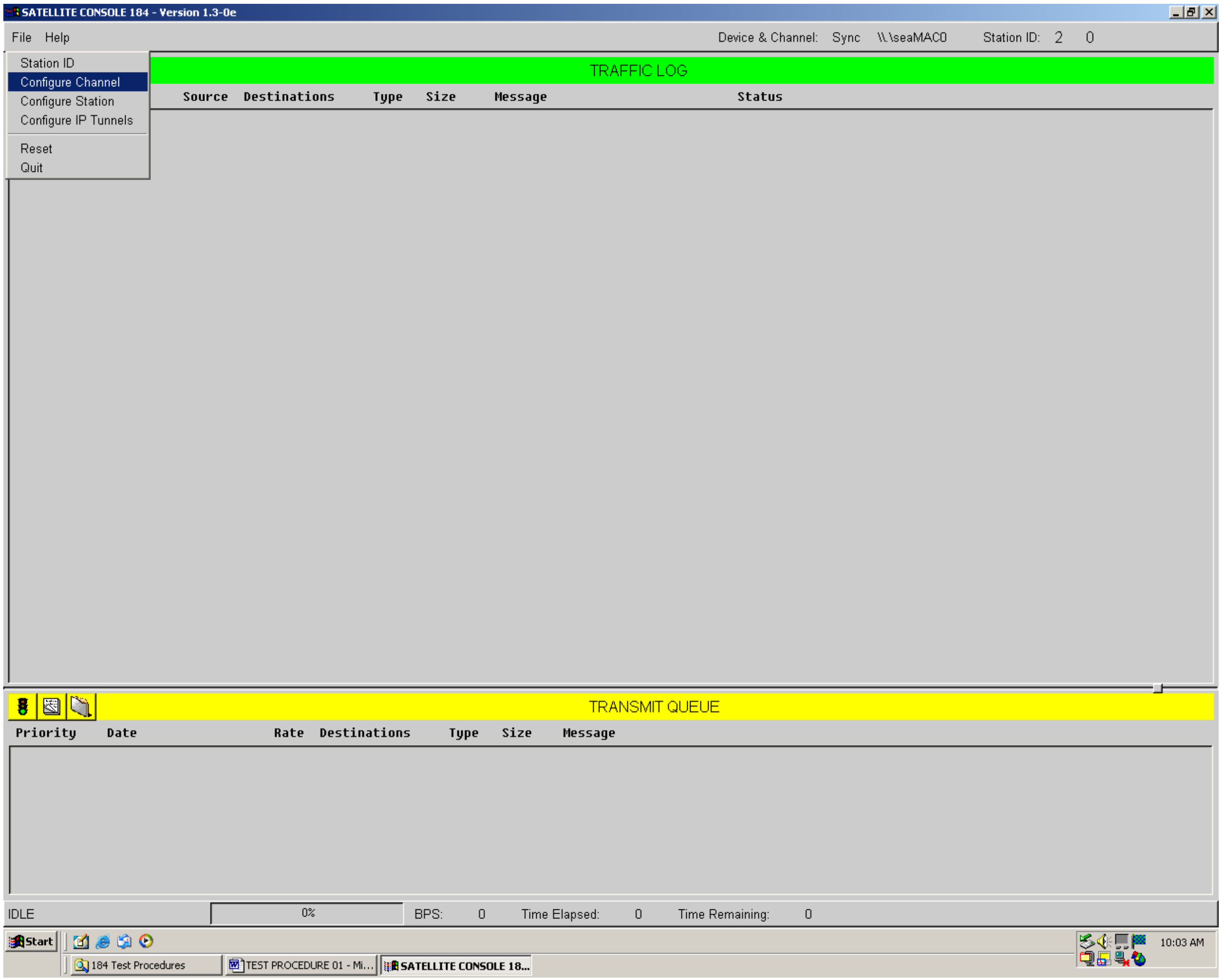


Select station ID (any number between 1 and 64).   After station ID is selected, click **Apply**, and then **Save**. Overwrite exiting file when prompted.



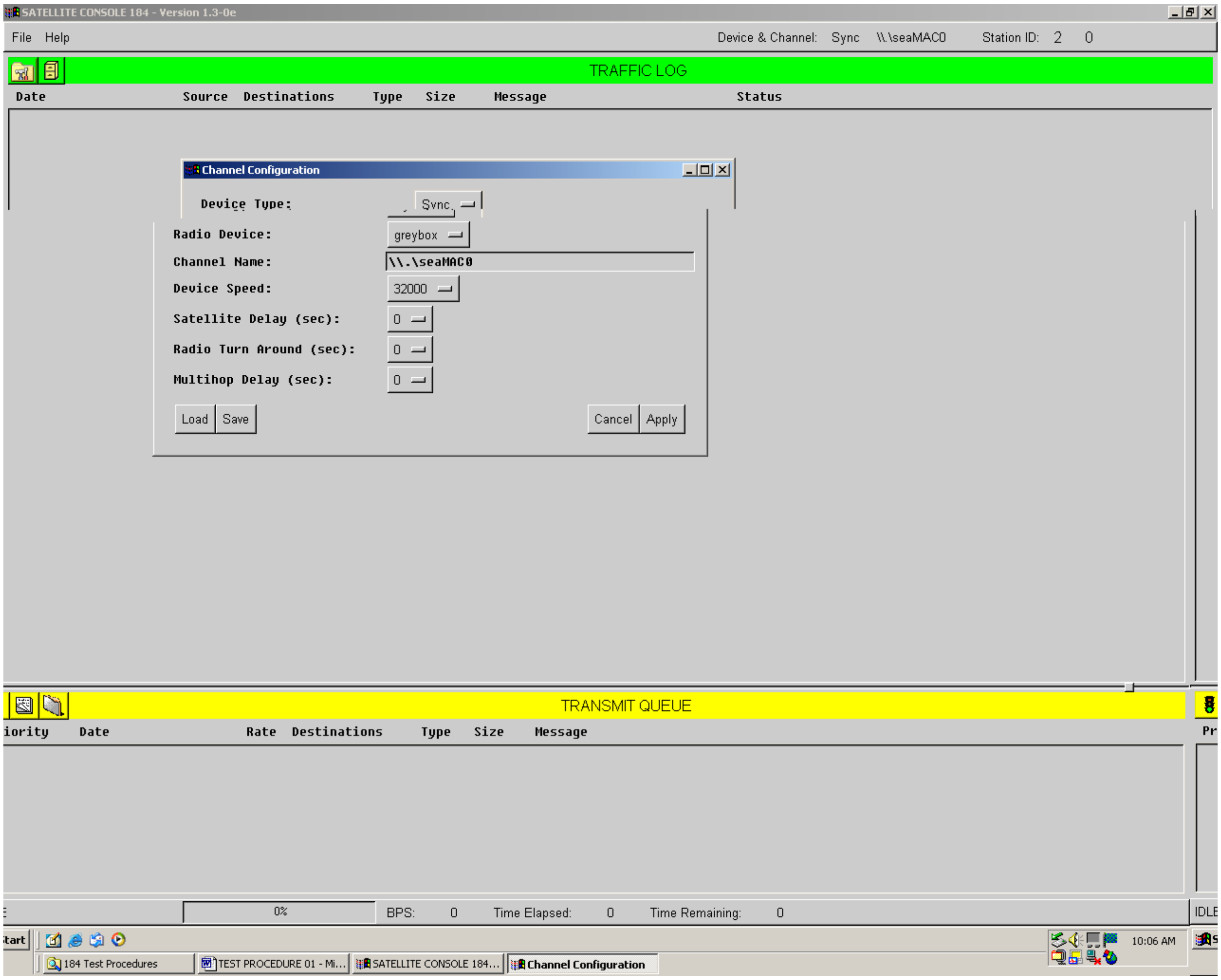
b. Configure Channel

Under **File**, select **Configure Channel**.



In the Channel Configuration, select the following:

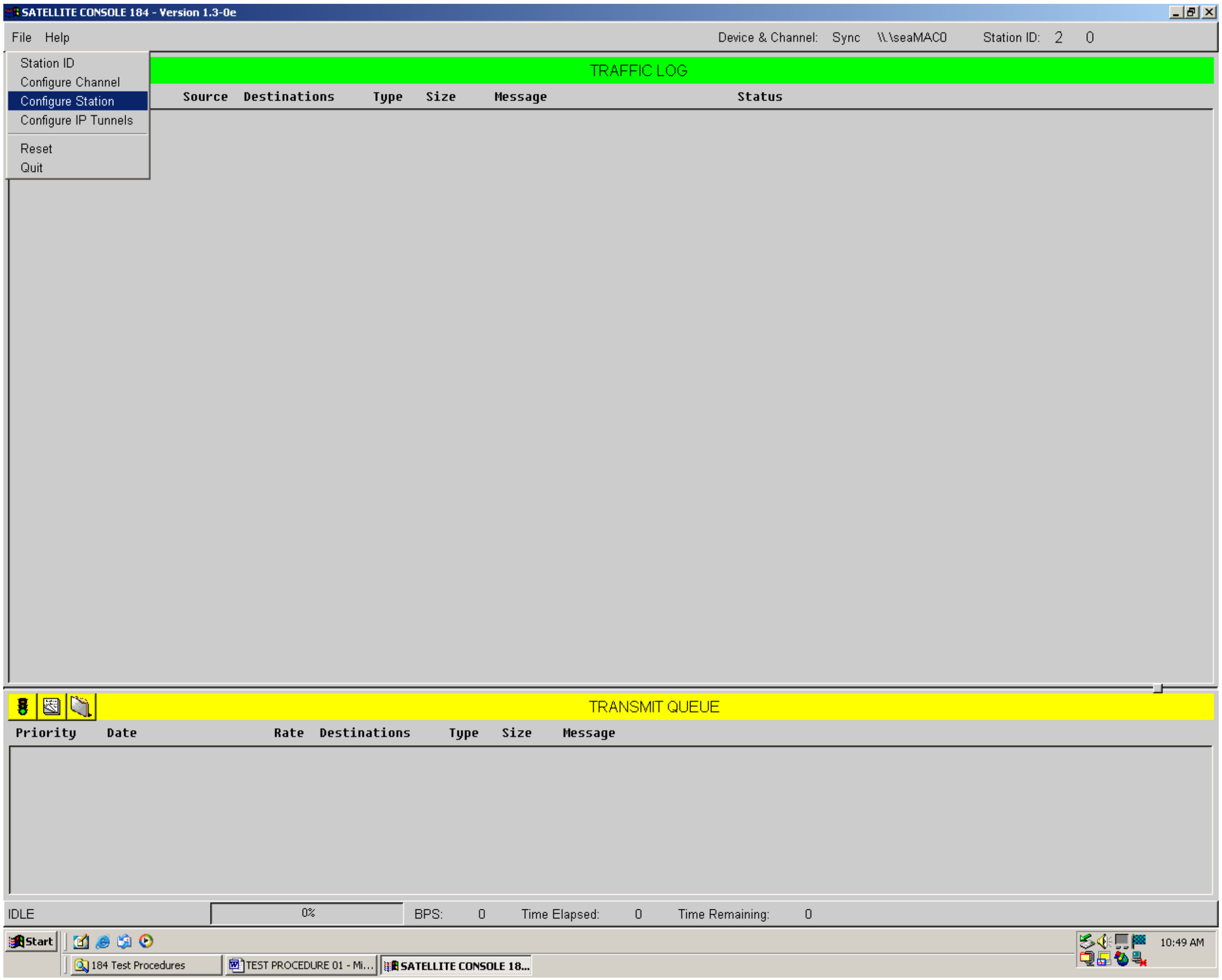
Device Type (select from the menu)
Radio Device (select from the menu)
Channel Name (this is based on which operating system the computer is running)
Device Speed (select from the menu)
Satellite Delay (in seconds)
Turn Around Time (in seconds)
Multihop Delay (in seconds)



After channel configurations are selected, click **Apply**, and then **Save**. Overwrite exiting file when prompted.

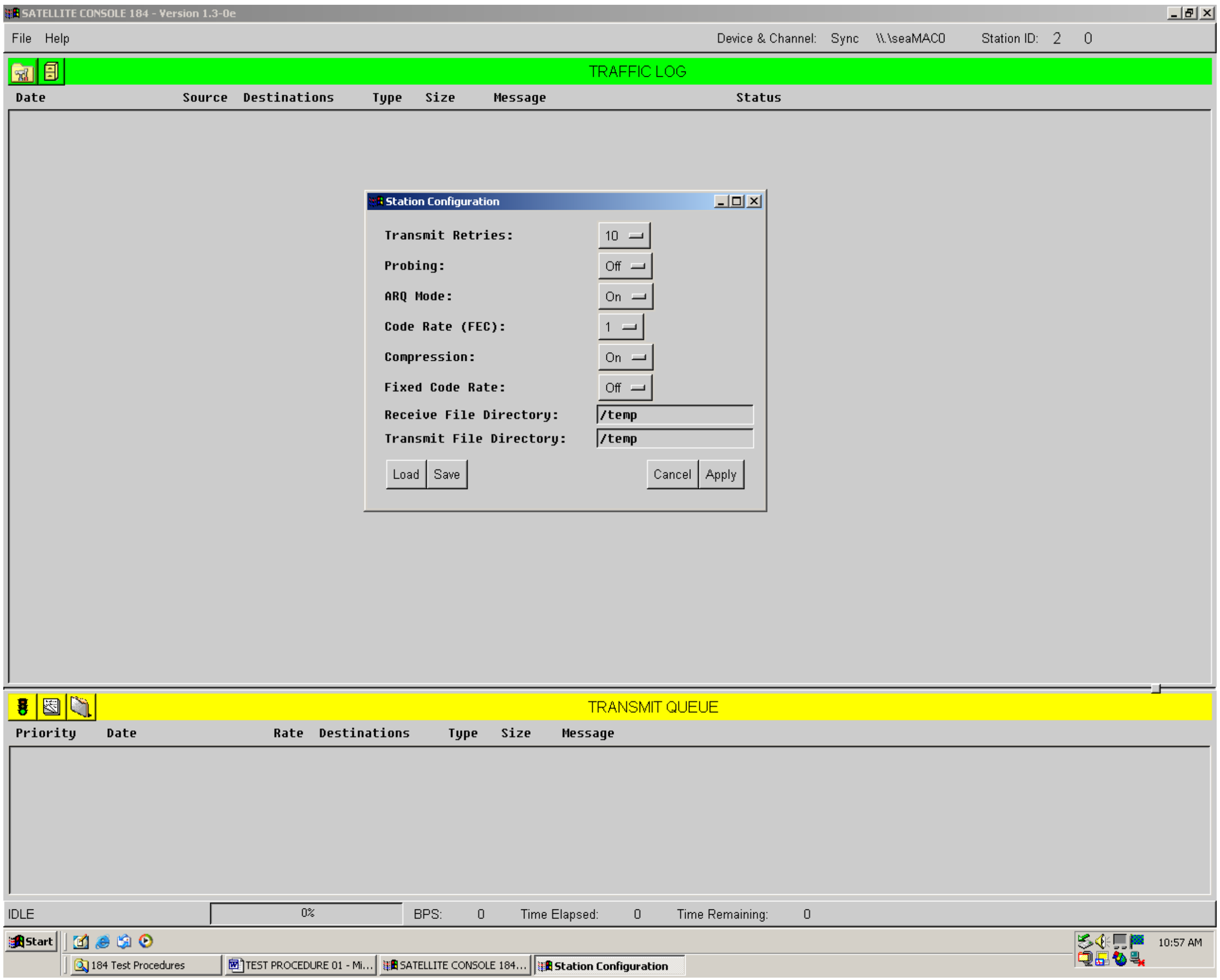
c. Station Configuration

Under **File**, select **Configure Station**.



In the Station Configuration, select the following:

Transmit Retries (select from the menu)
Probing (select from the menu)
ARQ Mode (select from the menu)
Code Rate (FEC) (select from the menu)
Compression (select from the menu)
Fixed Code Rate (select from the menu)
Receive File Directory (enter directory you wish to save received files to)
Transmit File Directory (enter directory you wish to transmit files from)



After station configurations are selected, click **Apply**, and then **Save**. Overwrite exiting file when prompted.